PREDICTOR VARIABLES IN READING ACHIEVEMENT: KINDERGARTEN AND FIRST GRADE

BY

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To

Leon
Lonnie
Alisa
Elizabeth

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This study investigated the significance of concepts about print and PREP screening variables as predictors of early reading achievement. The developmental nature of print awareness was monitored over a two-year period. Finally, the construct validity of the Test of Early Reading Ability was investigated.

Participants were 62 children enrolled in the same Alachua County school throughout kindergarten and first grade. Initially, the group was tested with the Alachua County Primary Education Program (PREP) Screening Battery. Readiness level was assessed with the Metropolitan Readiness Test and achievement, at the end of first grade, with the Metropolitan Achievement Test and the Test of Early Reading Ability. Subjects were also given the Concepts About Print Test four times during the two-year interval.

The data were analyzed using Pearson product-moment correlations, multiple and stepwise regression analyses, and split-plot analyses of

variance with repeated measures. Concepts About Print Test scores were also subjected to item and factor analyses.

Results from the correlational analyses indicated that the ten variables studied were related to readiness levels and seven were related to reading achievement. However, a reduced model of predictor variables for readiness levels retained only two of the ten. The reduced model of five predictor variables for reading achievement included one of the two readiness predictors.

Results from the analyses of the print awareness data indicated a main effect for language ability and time of test for total scores and three skill patterns. An interaction between group and time of test was found for the remaining pattern. Further analyses confirmed the existence of an ordered sequence in acquisition of print awareness skills over time. Trend analyses findings suggested that rate of acquisition was facilitated by instruction. While language ability influenced performance in the expected direction, one pattern, III, was too difficult for all students at the kindergarten level. Most students had not mastered it by the end of first grade even though the high language group's advantage over the average group had disappeared.

Construct validity of the Test of Early Reading Ability was verified in correlational analyses with three other achievement measures.

CHAPTER I
INTRODUCTION

Recent research (Day, Day, Spicola, and Griffin, 1979; Ehri, 1975; Johns, 1980) has established a relationship between the young child's knowledge of concepts about print and successful reading achievement. Investigations have attempted to explain the readiness level of the learner by observing overt behaviors as he/she encounters written language. It now appears that several stages of readiness can be identified as the child interacts with print and acquires knowledge of concepts about print. One very important language concept about print is understanding that print carries a message, a message that can be turned into speech. The young child gradually recognizes that pictures can be used as cues for comprehending that message, and that the print is as meaningful as its spoken counterpart. In addition, the "language" of instruction must be understood if the learner is to derive benefit from teaching.

Implicit awareness of language concepts about print must be integrated with knowledge of visual concepts about print for optimal progress in reading. Visual concepts about print can only be learned when printed media is used as a stimulus in the young child's "language experience activities." Establishing the link between speaking and reading requires repeated exposure to print, over extended time, in a variety of situations.

Traditional readiness tests and instructional materials have not addressed these skills and concepts. Typically, tests of readiness have assessed visual and auditory discrimination, letter identification, association of letter names and appropriate sounds, following directions, and listening activities. In spite of the fact that in 1927 readiness was described as ". . . a stage of development in which the learner is capable of getting meaning from the crooked marks which symbolize ideas" (Jenkins, p. 209), it has continued to be assessed in the absence of print. As recently as the mid-1970's Durkin (1974) discussed the frequency with which readiness tests rely upon pictures to assess the ability of children to handle written language. This is significant because studies, during that decade, consistently reported that concepts about print cannot be learned or properly assessed unless the child interacts with books and print. Teaching reading skills when the linguistic equipment for handling written language is inadequate may interfere with the reading process, or inhibit it altogether.

This study was concerned with the assessment and development of concepts about print in kindergarten and first grade students. More specifically, is level of print awareness a significant predictor of early reading behavior? To answer this question, the relationships between knowledge of concepts about print, reading readiness, and reading achievement were investigated.

Statement of the Problem

The purpose of this study was to determine the significance of knowledge of concepts about print for predicting early reading achievement. If it is a significant predictor of early reading performance, does it remain significant throughout kindergarten and first grade?

In other words, does an identified best set of predictor variables for student achievement at the kindergarten level change for first grade?

A second purpose of the study was to observe the longitudinal development of concepts about print. The intent was to determine the existence of developmental patterns (Day and Day, 1980a), stages (Clay, 1979), or sequences (Hiebert, 1981) in level of print awareness over the two-year period. Of particular interest was whether or not performance, over time, is a linear function of language ability and knowledge of concepts about print. Skill learning sequences must be preceded by the development and understanding of basic concepts and specialized vocabulary to deal cognitively with the new skill (Downing, 1979; Fitts and Posner, 1967). This implies a linear relationship between the learning of a skill sequence and language development. This study investigated the existence of such a linear relationship between level of print awareness and language ability.

An additional purpose of the study was to investigate the construct validity of a recently published instrument, Test of Early Reading Ability (Reid, Hresko, & Hammill, 1981). It samples both knowledge of the conventions of print and traditional reading tasks. Since traditional readiness tests have not measured knowledge of concepts about print, additional testing was necessary to get this information. Verification of TERA's validity could provide an alternative for obtaining more information with less time and effort required of teacher and student.

Significance of the Study

Knowledge of concepts about print has been linked to early reading behavior and subsequent reading achievement in recent research (Day et

al., 1979; Ehri, 1975; Evans, Taylor, and Blum, 1979; Harlin, 1981; Johns, 1980). Empirical evidence has consistently verified the existence of a positive relationship between print awareness and achievement. However, further study is needed to clarify inconsistencies regarding the strength and nature of the relationship. Knowledge of concepts about print has been reported to be the result of a single factor, whose development was described as a highly unified process (Kingston, Weaver, and Figa, 1972). The opposite view, that it follows a multi-stage developmental sequence, has also been supported with empirical data (Clay, 1979; Meltzer and Herse, 1969). This study investigated the view that print awareness is dependent on mastery of specific skill sequences within developmental patterns.

If the development of print awareness progresses through observable stages within a fixed hierarchy of skills, there are several implications for instruction to be considered. Teaching strategies could be identified to facilitate movement from one stage to the next. Activities requiring the child to interact with and respond to written language might become more evident in the early stages of instruction. Definitive information supporting developmental stages could be useful in identifying "high risk" candidates before they encounter reading failure. Early intervention, before unbalanced ways of operating on print become habituated and resistant to change, should reduce initial confusion and facilitate skill acquisition. This could help the learner acquire a system for operation on print that would facilitate integration of new knowledge with old, reduce the possibility of skill fragmentation, and increase the probability of success in reading.

Generalizability of findings from previous studies has been limited. Conclusions have been based on performances of non-representative samples for one or more of the following reasons. First, the number of subjects included in the sample was often very small. Secondly, the subjects frequently represented narrowly defined socioeconomic strata. And finally, when the samples did include minorities, their proportion of the total sample was minimal.

The present study extends the generalizability of findings to a new geographic area. This sample was larger. It also included subjects from broader socioeconomic strata and a larger proportion of the total sample was composed of minorities.

This study may have particular significance for the school district in which it was conducted. It may provide information to justify the revision or simplification of the educational screening required by PREP at the kindergarten level.

Definition of Terms

Directionality. Directionality refers to the understanding that print is always read from left to right. The left page is always read before the right page. It is knowing that reading begins at the top left corner of the left page with the first line of print, moving across the line to the right margin, returning to the left side at the beginning of the next lower line of print, continuing to "snake" down the page until all the lines are read.

Language Concepts About Print. Language concepts about print include 1) an understanding that print can be turned into speech to provide a message; 2) a knowledge that pictures can cue the message; 3)

a realization that print is as sensible as spoken language; and 4) an understanding of the vocabulary/terminology needed to think and talk about reading.

Linguistic Awareness. Linguistic awareness is used synonymously with language concepts about print in this study.

PREP. PREP is an acronym for the Primary Education Program adopted by the Florida Legislature in 1979. House Bill 1036 was enacted to "improve educational opportunities to meet the unique needs, talents, interests, and abilities of each student in kindergarten and the primary grades." It requires educational screening and further assessment for students performing above and below grade placement. Following screening and assessment, preventative, developmental, or enrichment strategies are assigned to each child.

Print Awareness. Print awareness is an inclusive term referring to both language and visual concepts about print.

Visual Concepts About Print. Visual concepts about print include an awareness that space functions as a boundary for words, an understanding of the directionality of the reading process, and a knowledge of the punctuation and capitalization cues.

Word Boundaries. Word boundaries, the physical limits that define printed terms, are designated by the space preceding initial and final letters of graphic arrays; the space that surrounds one unit, group, or string of letters, separating it from all others.

Limitations

The sample population was restricted to all the first grade students (62) who had been enrolled in the same school throughout kindergarten

and first grade. Therefore, results from this study can be applicable only to those ages and grade levels.

District-wide achievement testing was scheduled for early April, so the cut-off day for collecting data was April 15, 1982. This means that subjects in the study still had a full six weeks of instruction before completing first grade. Making this decision allowed a greater degree of control in keeping the time variable constant, but it also tends to cause reservations in interpreting the data. Six weeks can be a significant instructional interval for first grade students.

The instruments for measuring concepts about print were limited to the Concepts About Print Test and the Test of Early Reading Ability. Performance on these measures required subjects to interact with print. For this reason, findings cannot be generalized to situations where an abstract verbal response (in the absence of print) is used to determine level of print awareness. It must be recognized that asking a child to verbalize the concept of "word" is not the same as having the printed symbol for a word identified. Generalizations of findings from such dissimilar environmental contexts should be viewed cautiously.

Hypotheses

The following major hypotheses, stated in the null form, were tested in this study. Follow-up analyses were conducted when statistical significance was found. All hypotheses were tested at the 0.05 level of significance.

Hypothesis I. There is no relationship between knowledge of concepts about print, measured by the Concepts About Print Test, PREP screening variables, sex, race, and reading readiness, measured by the Metropolitan Readiness Test, at the end of kindergarten.

Hypothesis II. There is no relationship between knowledge of concepts about print, measured by the Concepts About Print Test, PREP screening variables, sex, race, and reading achievement, measured by the Metropolitan Achievement Test, at the end of first grade.

Hypothesis III A. There are no differences in levels of print awareness, measured by the total score on the Concepts About Print Test, for students of different language abilities, measured by the Florida Language Screening System.

Hypothesis III B. There are no differences in levels of print awareness, measured by the total score on the Concepts About Print Test, throughout kindergarten and first grade.

Hypothesis III C. There is no significant interaction between the time of test and group membership for the total score on the Concepts About Print Test.

Hypothesis III D. There are no trends in performance on the total scores of the Concepts About Print Test throughout kindergarten and first grade for three language groups.

Hypothesis IV A. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern I, for students of different language abilities, measured by the Florida Language Screening System.

Hypothesis IV B. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern I, throughout kindergarten and first grade.

Hypothesis IV C. There is no significant interaction between the time of test and group membership on the Concepts About Print Test--Pattern I scores.

Hypothesis IV D. There are no trends in performance on the Concepts About Print Test--Pattern I throughout kindergarten and first grade.

Hypothesis V A. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern II, for students of different language abilities, measured by the Florida Language Screening System.

Hypothesis V B. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern II, throughout kindergarten and first grade.

Hypothesis V C. There is no significant interaction between the time of test and group membership on Concepts About Print Test--Pattern II scores.

Hypothesis V D. There are no trends in performance on the Concepts About Print Test--Pattern II throughout kindergarten and first grade.

Hypothesis VI A. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern III, for students of different language abilities, measured by the Florida Language Screening System.

Hypothesis VI B. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern III, throughout kindergarten and first grade.

Hypothesis VI C. There is no significant interaction between the time of test and group membership on the Concepts About Print Test--Pattern III scores.

Hypothesis VI D. There are no trends in performance on the Concepts About Print Test--Pattern III throughout kindergarten and first grade.

Hypothesis VII A. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern IV, for students of different language abilities, measured by the Florida Language Screening System.

Hypothesis VII B. There are no differences in levels of print awareness, measured by the Concepts About Print Test--Pattern IV, throughout kindergarten and first grade.

Hypothesis VII C. There is no significant interaction between the time of test and group membership on the Concepts About Print Test--Pattern IV scores.

Hypothesis VII D. There are no trends in performance on the Concepts About Print Test--Pattern IV throughout kindergarten and first grade.

Hypothesis VIII. There is no relationship between reading achievement, measured by the Metropolitan Achievement Test, early reading ability, measured by the Test of Early Reading Ability, knowledge of concepts about print, measured by the Concepts About Print Test, and basal reading level, determined by Ginn placement, at the end of first grade.

Organization of the Study

The first chapter provided a statement of the problem to be studied and a discussion of its educational significance. It also contains definitions of relevant terms and hypotheses to be tested. Chapter II reviews literature that provides the theoretical background on which the

study is based and discusses the research pertinent to this investigation. Chapter III describes the participants, the procedures to be followed, and the complete methodology used. The findings and analyses of data are presented in Chapter IV. Chapter V includes a summary of the findings and conclusions drawn as a result of the study. Implications for practice and further research are also discussed in the final chapter.

CHAPTER II
REVIEW OF RELATED LITERATURE

The literature reviewed in this chapter presents a theoretical basis for explaining the initial confusion with which children approach reading instruction. It also summarizes the research concerning the language concepts about print as they relate to early readers, the reading process itself and the language of instruction. Research related to visual concepts about print is also reviewed, specifically that concerned with word boundaries and awareness of printed words. In addition, research concerned with the development of the Concepts About Print Test is summarized. Finally, research validating it for use in the United States has been reviewed.

Theoretical Background

Instructional materials for beginning readers make frequent references to linguistic terms such as "word," "letter," "sound," and "sentence." The young child's ability to understand linguistic concepts about print has characteristically been ignored by the teacher and text in primary classrooms. However, inability to comprehend the meaning of the instructional language peculiar to the teaching of reading and writing may inhibit the acquisition of appropriate prereading behaviors and retard progress in later reading achievement.

Linguistic concepts about print, terminology used in the teaching of reading, have been categorized and labeled "the reading register" by Downing (1976). Samuels (1979) labeled such linguistic terminology

as the "language of instruction" or "conventions of print." Mattingly (1972) preferred "linguistic awareness," which he defined as the process whereby children develop knowledge and understanding about the nature of their own language. Weaver and Shonkoff (1979) extended the definition of linguistic awareness to ". . . include(s) knowing what reading is: knowing conventions of print such as reading from left to right, top to bottom, one line at a time; and knowing the concepts of a letter, word, sentence, or story" (p. 30).

Whatever label is used to explain the phenomenon by which children develop an awareness and understanding of concepts about print is of no consequence. The important issue is that beginning readers acquire the linguistic equipment necessary to deal analytically with language in the two dimensional medium of print. Inability to comprehend "teacher talk" leads to confusion and inhibits the formation of cognitive structures and thought processes needed to assimilate and/or accommodate the new reading related vocabulary (Piaget, 1955).

Twenty-five years ago Vernon (1957) observed that the fundamental characteristic of reading disability was cognitive confusion. After extensive study of backward readers, she concluded ". . . thus the fundamental and basic characteristic of disability appears to be cognitive confusion and lack of system" (p. 71).

Ten years later, in a very extensive and thorough review of the literature related to the psychology of skill development, Fitts and Posner (1967) identified three phases common to the learning of any skill sequence. The cognitive phase is first. It must be mastered for continued success in whatever one is learning. In this phase the

learner acquires basic concepts and identifies the kinds of stimuli to attend to the new situation. This phase includes the development and understanding of the technical vocabulary peculiar to the subject to be learned. In phase two, the newly acquired responses are linked with the appropriate stimuli. Then, reinforcement and practice sessions are repeated until the new skill reaches the automatic level in phase three.

Fitts and Posner explained that most reading teachers concentrate on phase two and neglect, or ignore completely, the cognitive phase that must precede the pairing of stimulus and response. Since this phase is ignored, the learner searches for some organizing or discriminating relationship between stimulus and response. This confusion increases and becomes more prolonged than would be the case if teachers carefully and systematically introduced students to the basic language concepts related to beginning reading instruction. The researchers suggest that the child's initial cognitive confusion may hinder the teacher's efforts in teaching what he perceives to be the main instructional task--phase two.

Influenced by the work of Vernon (1957) and Fitts and Posner (1967), Downing (1967, 1969, 1976) conducted several studies to determine the young child's understanding of "the reading register." He proposed a cognitive clarity theory of learning to read to explain the general confusion he observed in beginning readers. Downing's (1979) theory can be summarized into eight postulates:

> (1) Writing or print in any language is the visible code for those aspects of speech that were accessible to the linguistic awareness of the creators of that code or writing system; (2) this linguistic awareness of the creators of a writing system included

> simultaneous awareness of the communicative function of language and certain features of spoken language that are accessible to the speaker-hearer for logical analysis; (3) the learning-to-read process consists in the rediscovery of (a) the functions and (b) the coding rules of the writing system; (4) their rediscovery depends on the learner's linguistic awareness of the same features of communication and language as were accessible to the creators of the writing system; (5) children approach the tasks of reading instruction in a normal state of cognitive confusion about the purposes and technical features of language; (6) under reasonably good conditions, children work themselves out of the initial state of cognitive confusion into increasing cognitive clarity about the functions and features of language; (7) although the initial stage of literacy acquisition is the most vital one, cognitive confusion continues to arise and then, in turn, gives way to cognitive clarity throughout the later stages of education as new sub-skills are added to the student's repertory; (8) the cognitive clarity theory applies to all languages and writing systems. The communication aspect is universal, but the technical coding rules differ from one language to another. (p. 37)

Evidence from several countries (Clay in New Zealand, 1972; Downing in England, 1967; Johns in the U.S., 1977; Meltzer and Herse in the U.S., 1969; Reid in Scotland, 1966) seems to support Downing's view of the universality of initial cognitive confusion surrounding the language of reading instruction and the conventions of print. Although this appears to be the common state of beginners as they approach skill learning generally, it is particularly hazardous because society has created a critical period for learning to read. If this confusion persists, the young child may not beat the end of first grade deadline for accomplishing this task. Presently there appears to be a lack of adequate consideration of the problem, and few specific strategies for leading children out of the confusion toward cognitive clarity.

Print Awareness in Early Reading

Case studies of early readers have indicated that some children develop an early awareness of written language. The children in Durkin's (1966) classic longitudinal studies of early readers shared a common interest in writing and a fascination with the print itself. They were curious about the identification of printed words, letters and numbers. Their inquiries about word meaning, letter sounds, and spelling came about, naturally, as they interacted with print. Early discovery of meaning and purpose in the medium of print was facilitated by someone, usually a mother, who supplied answers to the questions raised by these early readers. Thus, it appears that learning to read originates the moment a child becomes curiously aware of print and begins to ask questions about it (Smith, 1976).

Early fascination with printed language is not limited to children of social and economic advantage. While these environmental factors may contribute to an early awareness of the uses and purposes of print, they are not essential. Torrey's (1973) case study of a black five-year-old boy who taught himself to read illustrates this point. The subject came from a poor socioeconomic background. He learned to read by watching television commercials. He lacked exceptional verbal skills, yet, he seemed to know intuitively that written language was a symbolic representation of speech. The researcher concluded that the boy expected print to say something to him and interacted with it, accordingly. While ability to verbalize linguistic concepts and cultural advantage may foster reading acquisition, these are not crucial factors for all children.

A decade after Durkin's study was published, Clark's (1979) investigations of young readers also emphasized their early interest in print, writing, and reading. She reported that product logos and television advertisements had fostered an awareness of print in her subjects, especially the boys. Most of Clark's early readers were unable to give verbal explanations of such terms as "letter" and "word." Nevertheless, their reading behavior seemed to reflect some intuitive understanding of "units of meaning" and specific ordinal arrangements of some "element" to produce such units.

Linguistic Concepts About Print

I. Children's Perceptions of Reading

The interview technique has been used extensively by researchers to investigate the young child's understanding of language concepts about print. The child's perceptions of the reading process and reading related concepts have been based on "verbalizable" knowledge in response to an interviewer's questions. This was the technique used by Weintraub and Denny (1965) in a two-year longitudinal study initiated in 1962. During the first week of school, 108 first grade children from five classrooms representing rural, all Negro, lower-class socioeconomic, and middle-class socioeconomic status schools, were interviewed. Their responses to a questionnaire (Denny and Weintraub, 1963) were recorded. Analysis of taped responses indicated that one-fourth could not verbalize a description of the reading act. The remaining responses were categorized as object related (referred to reading materials) or cognitive related (referred to reading as a meaningful activity). Of the 73% who could verbalize intelligible ideas of reading, only 20% saw reading as a cognitive process or a thinking, meaningful act.

A year later Denny and Weintraub (1966) used the same procedure with 111 students. Previous results were verified. More than one-third of the children could not give a meaningful explanation of how one learns to read. More than a fifth of the children thought the teacher would show them how to read, and only about 37% saw themselves as active participants in the learning to read process.

These studies exemplified the findings that Brumbaugh (1940) and a group of student teachers had noted a quarter of a century earlier. Although her work was not scientific in its procedures and methodology, her conclusions, based on "talks" with 700 kindergarten students, were supported empirically by the findings of Weintraub and Denny. The work of these researchers provided empirical evidence that a large number of the children entering first grade, even though they had been through a kindergarten readiness program, had no understanding of what "reading" was and what they had to do to learn to read.

Mason (1967) suggested that one of the first steps in learning to read may be learning that one doesn't already know how. He interviewed 178 preschool children in Clayton County, Georgia. Ninety percent of this group of three-, four-, and five-year-olds believed they could already read and replied that they liked doing it. The researcher says his sample was racially, socioeconomically, and intellectually stratified. Even though his sampling procedure had been carefully designed, the students' parents had to be willing to provide transportation to the interview sites. Most of the children had seen and heard reading in their homes. In spite of the precautions taken, the sample may not have been representative of the population at large. It should be noted that

the transportation requirement may have reflected differential effects of parental interest and socioeconomic advantage. However, his findings did verify the existence of cognitive confusion concerning the reading act.

Confusion about the process of reading is not limited to the young children in the early stages of reading. Johns (1972) explored the question, "What is reading?" in a longitudial study involving fourth, fifth, and sixth grade students. The surprising result was, that at this level, abled as well as disabled readers demonstrated a lack of understanding of the reading act. Johns hypothesized that such a deficit might influence level of reading achievement. He suggested that dialogue about the reading act, between researchers and teachers, should be focused on finding a better way to utilize available knowledge. He also encouraged teachers to discuss this process with their students in the early elementary grades.

Several studies have shown that minority groups also have misconceptions about the reading process. Yakima Indian children (Oliver, 1975) confused reading with looking, letters with numbers, and writing with drawing. Again, as Mason (1967) reported, the three-year-olds thought they could already read, and the five-year-olds knew they could not read. Kindergarten aged Indian children in Canada (Downing, Ollila, and Oliver, 1971) were found to have an inadequate understanding of the reading and writing processes. Older Navajo Indian children (DuBois, 1979) indicated in interviews that they believed the purpose of reading was to learn English. They were bilingual and could handle English syntax well, but they were unaware that reading was supposed to make sense. While these studies do show the reading process is not

understood by minority groups, these data must be viewed cautiously. Sociocultural factors and test bias may have tainted the results. A mismatch between the reading instruction or materials and the ethnocultural experiential background of the subjects may have caused the confusion observed (Soderberg, 1977). The researchers reported that experiences with books, learning activities, watching television, and interacting with other children seemed to have more effect on concept building than age (Clark, 1979; Durkin, 1966).

II. Instructional Terminology

Reid (1966) was one of the first researchers to call attention to the child's inadequate understanding of the instructional terminology used to teach reading. Her purpose was to explore the formation of the technical vocabulary of reading and writing instruction. She interviewed twelve five-year-old children (seven boys and five girls) early in the year, about midway through, and at the end of their first year in school. Her sample was randomly selected from a class of about 40, representing varied socioeconomic status, in Edinburgh, Scotland. The first interview revealed that the children had little knowledge of what reading consisted of, nor did they know its uses or purposes. They did not understand the instructional language, commonly used by teachers. They were confused by such terms as "word, letter, sound, and number." The understanding that all language is composed of words was foreign to them. While some children were aware that writing was composed of letters, there was little indication that they understood that those letters composed words.

After the third interview, the technical terminology had been mastered at different rates and with various degrees of success.

Reid concluded that the reading success of her sample depended on the availability and understanding of the technical vocabulary commonly used in the teaching of reading. While she did not advocate direct teaching of these terms, she did suggest that facilitating the development of such concepts would be important to the reading process. Though her sample was small, Reid's work was significant because it showed the importance of providing the beginning reader with the language concepts necessary to talk about reading.

A year later Downing (1967) replicated and extended Reid's findings with 13 five-year-old English subjects. The stimulus for Downing's study was provided by Reid herself when she discussed her subjects' linguistic inadequacy. She admitted that ". . . it may be argued that the child may know a certain term but not use it when given the opportunity" (p. 58). To explore this possibility, Downing included concrete aids (photographs, a pictureless book, pictures of a car, and toy buses) with Reid's interview, and added an experimental methodology. Both verbal and motor achievement of Downing's subjects increased with the addition of concrete stimuli. This procedure showed that children may be able to demonstrate some understanding of a concept before they can verbalize it in intelligible dialogue.

Additional evidence to show that children's concepts of letter, word, and sentence are vague and confused was supplied by Francis (1973). Thirty girls and twenty boys, from five to seven years old, were deliberately selected to represent good social backgrounds and average ability. In each of four test sessions, at six-month intervals, the subjects were asked to demonstrate an understanding of the linguistic

concepts of word, letter, and sentence in two ways. They gave verbal explanations and identified graphic examples. The concept of letter gave the least difficulty and was learned first. The children learned the concept of letter in the process of learning to read, and derived the concepts of word and sentence as they mastered reading and writing. Francis questioned Downing's view that cognitive confusion is due to the abstract nature of the concepts. She wondered instead, if the problem occurs because the concepts overlap in their application and are poorly defined.

Visual Concepts About Print

Availability and variety of printed materials is an environmental factor that is positively related to early reading (Teale, 1978). Interaction with "print" is necessary for children to learn visual concepts about print. Visual concepts about print include knowledge of directionality conventions, word boundaries, and punctuation/capitalization constraints. Evaluation of the child's knowledge about these conventions of print is based on the performance of tasks specified by the researcher. While the tasks and methodology have varied from study to study, there is still much to be learned from the research investigating when and how a child recognizes the printed word.

I. Word Boundaries and Word Structure

Instructional materials and teaching practices may contribute to the six-year-old child's understanding of what constitutes a printed word. Classroom strategies and procedures that help children to recognize that printed words are graphic arrays bounded by increased space may be needed. Meltzer and Herze (1969) questioned the assumption that first graders can easily, or naturally, discriminate word boundaries

without assistance (Hochberg, 1970). They wanted to determine the extent to which 39 first graders were able to perform this task. They also wanted to discover the extent and types of confusions the children had about word boundaries. Nine specific tasks, requiring about ten minutes per child were designed to supply this information.

The data supported a developmental sequence in the concept of word boundaries, from the equation of words and letters through a gradual elimination of a number of cues related to "tall letter" occurrences and length of word, before space was identified as the determinant. Even then, the appearance of a tall letter in the middle of a long word led to confusion. The researchers acknowledged that reading materials, in use at the time, may have added to the confusion. A majority of the words in the preprimers had tall letters in initial and/or final positions. Furthermore, at no point in the teaching materials was it recommended that the teacher explain the significance of space as a cue for recognizing words. These data suggest that children make reasonable deductions about print, but not necessarily the ones expected by the teacher or the text.

In a replication of Meltzer and Herse's work, Kingston, Weaver, and Figa (1972) observed the performance of 45 first graders who were randomly selected from 150 in a rural Georgia school district. Children of upper, middle, and lower socioeconomic backgrounds were included. Their task was to segment print into its lexical units by cutting between the words of a typed sentence in which space between the words had been eliminated. The sentences all contained two to six words. Whether the sentences contained real words or nonsense approximations, the results

were the same. The most common error was combining words. They did not find evidence of a developmental sequence as had Meltzer and Herse, but their data did verify that young children experience difficulty in discriminating increased space as the boundary separating printed words. Interestingly enough, in one of the earliest studies of beginning reading, Gates and Boeker (1923) hinted that discriminating word boundaries might be particularly hazardous for young learners. They observed that perceptual strategies employed by children, who were learning to recognize words, closely resembled those of adults trying to learn Chinese writing characters. They suggested that learning to see words as separate entities might be the most difficult task in learning to read.

In the same year that the Kingston, Weaver, and Figa study was published, two experiments dealing with children's conceptions of word boundaries were also reported by Holden and MacGinitie (1972). A white, middle class sample of 37 girls and 47 boys were assessed at the end of kindergarten. The subjects were instructed to tap a poker chip for each word in a tape recorded sentence. The most common error was failure to separate the content words from the function words preceding them. "Big boy," "at home," and "the store" were frequently perceived as one entity. Some children, as old as seven years, are unable to make this distinction. This finding was supported in a more recent study by Blachowicz (1978).

In a second experiment with 57 of the original sample, Holden and MacGinitie (1972) attempted to determine the speech-print match capabilities of the children. These children were asked to segment an oral sentence into words by tapping once for each word. Then, they were

required to tell which of four sentences presented visually had the same number of words. As might be expected, a great degree of confusion resulted. The researchers decided the confusion showed that subjects were unable to discriminate word boundaries. Using the subject's names, they taught the children to recognize space as an indicator of wordness. Only five of the children performed the task with any consistency following the teaching. A majority of the children, who would verbalize the function of space as a boundary for words, could not match speech with its printed counterpart. These results indicate the need for additional study to discover better methods of assisting children in bridging the gap between the linguistic concept of word and its graphic representation. Part of the confusion exhibited by the subjects in this study could have resulted from the task and the experimental procedures. A simplified procedure could have been used. Requiring the students to segment the same sentence after the oral presentation could have eliminated the tapping and counting. It may also have reduced the amount of confusion generated, though some of it was obviously the result of the children's limited understanding of the function of space as a boundary for words.

In a similar investigation Mickish (1974) demonstrated that cognitive confusion about word boundaries persists even after a year of reading instruction. This sample consisted of 17 white children from a southern suburban middle- and upper-class socioeconomic class background. Using words selected from the instructional materials they had read, six word sentences were composed. The words in the sentences were printed

as letter strings with all spaces eliminated. The subject's task was to draw a line between the words. Training in task expectations was provided. In spite of the fact that the words were familiar, almost half of the children were unable to mark all six words correctly. This study was significant for several reasons. Its methodology was superior to that of earlier studies cited; it verifies the existence of confusion surrounding concepts about print even with a much simplified task; and it demonstrates the persistence of that uncertainty long after formal reading instruction has begun. Children's concepts about print change as they become aware of the characteristics of words peculiar to speech and print, but that change is reflected in a long and slow elaboration process (Papandropoulou and Sinclair, 1974; Sulzby and Templeton, 1980; Templeton and Spivey, 1980).

Learning to read brings about a major change in a child's linguistic knowledge. To prove this point Ehri (1975) explored aspects of beginning reader's and prereader's word knowledge. Thirty-five white middle-class children in California were subjects. Nine were preschoolers, sixteen were in kindergarten, and ten were first graders.

Analyses of task performance records at the end of the school year showed that readers outperformed prereaders on all tasks. Prereaders characteristically confused syllables with words. The researcher suggested that readers may have been superior because they had viewed the printed correlates of spoken words, and were learning how speech is represented in print, thus, affording them greater conscious awareness of words. She also acknowledged the possibility that the superior lexical awareness of the readers could have been due to age rather than

experience with print. Perhaps the higher performance of the readers was a result of both factors!

What aspects of written word structure are used by beginning readers? This was the question asked by Marchbanks and Levin (1965). Their sample consisted of 50 kindergarten and 50 first grade students from Dryden, New York. The younger group had received no instruction in alphabet recognition or reading. Subjects had to choose a stimulus, similar to a word they had been exposed to, from a group of pseudowords. The response patterns were similar for both groups. The first letter was the most important cue for both groups, the final letter was the second in importance, and word shape or configuration was weakest. They hypothesized that the relative strength of specific letters in the initial and final positions of a word as a recognition cue was a function of the white space surrounding it. These conclusions have been substantiated recently in three studies reported by Pick, Unze, Brownell, Drozdal, and Hopmann (1978).

II. Awareness of Printed Words

How do children become aware of the printed word? The ability of young children to "read" common signs and advertisement has been documented (Goodman, 1980; Hiebert, 1978). But Dewitz and Stammer (1980) wanted to know when words emerge as separate entities independent of context. In other words, they wanted to know if children responded to the print itself, or to distinctive characteristics of the logo or trademark, or to the logo in toto. Twelve nursery school children in each of three age groups (three-, four- and five-year-olds) made up the sample. Each age group had an equal number of boys and girls representing middle- and lower-middle socioeconomic strata. Sixteen logos were

presented to the subjects in four conditions: (1) logo in context; (2) logo alone; (3) logo in a misleading context; and (4) logo in printed manuscript form. The data showed that skill increased with age in the first two situations. Only 20% of the responses accurately identified logos in misleading contexts, and none of the children could identify the logos in manuscript. However, their responses showed developing awareness of words. Some children called the stimuli words, names, numbers, and letters. Some identified each letter and some gave no response. How they responded was influenced by age. The older children most frequently identified the stimulus as a word and the younger ones gave more nonresponses.

Performances on letter and word recognition tasks were compared with logos reading performances. Correlational analyses showed that increased skill in reading logos in context paralleled increases in identifying letters and writing one's name. Thus, Dewitz and Stammer concluded that much of the phenomenon of logo reading is "pseudoreading" and ". . . it is doubtful that young children focus on the print itself as a major feature of these signs" (p. 11). Furthermore, even though letter recognition improved as ability to read logos increased, evidence for a causal link was not discovered.

The results reported by Dewitz and Stammer give some credibility to the developmental sequence proposed by Mason (1980). In her study of four-year-old preschoolers to determine the developmental sequence in awareness of printed words, she identified three levels of development. Context dependency, the first level, was demonstrated by children "reading" (pseudoreading, according to Dewitz and Stammer) signs and

advertisements. Visual recognition, the next level, revealed children calling or "spelling" out letter names and sounds in their attempts to pronounce a list of three letter words. At the highest level, children had progressed to the point where they tried to organize their knowledge of sound-symbol relationships to identify words. Dewitz and Stammer's data from the youngest and oldest groups confirm the existence of such a trend in awareness of the printed word. Their youngest group was almost totally context dependent. The oldest group was less dependent on context and knew most letters by name, but recognized very few words.

Progress through the sequence hierarchy was not uniform for Mason's (1980) sample. Even though they were the same age and had similar home backgrounds, variation in level of awareness and rate of progress was noted. Dewitz and Stammer's subjects were less advanced even though one group was a year older. They attributed this difference to Mason's methodology. Since most of her data was obtained from parent responses to a written survey, its reliability and validity may be questioned. The significance of the Dewitz-Stammer study is that it used scientific data collection methodology to confirm the developmental trend suggested by Mason for multi-age preschool children of more heterogeneous socio-economic backgrounds.

Both of the previous studies lend credibility to an earlier hypothesis proposed by Hiebert (1978). She suggested that the ability to "pseudoread" print in a contextualized setting might be a part of the reading process. Three- and four-year-old preschool children were shown ten slides in which words or letters were presented in and out of context. Significant differences in error patterns were reported for

"in"-"out" of context stimuli and also word-letter stimuli. Based on these results, she concluded that young children have concepts about written language which could be considered part of the reading process and necessary precusor to reading skills. She pointed to the greater number of correct responses for "in" context stimuli as evidence that preschoolers know how to use the environment to make sense of written language. She noted the similarity between learning to speak, when the child's knowledge is initially context bound, and learning to read, when first attempts to make sense of written language are also context bound.

Hiebert's (1981) latest study has produced results contradicting her earlier proposition that print awareness involves a developmental sequence of skills that is a prerequisite to reading skills. The purpose of this study was to establish the developmental patterns of print related concepts and skills over the preschool years and determine existing interrelationships. Since previous research generally focused on a singular dimension of print awareness, the researcher was particularly interested in how concepts about print develop in relation to one another. Is print awareness characterized by isolated development of a series of skills and concepts? To find answers to the questions raised, Hiebert included a variety of measures for assessing concepts about print, and tested children over a wide age range. Her 60 subjects came from a preschool and a daycare center where both student populations were from predominantly middle-class socioeconomic backgrounds. For a subject to be selected, both parents had to be present in the home. Three-, four-, and five-year-old groups had an equal number of boys and girls from both schools.

Each group was tested on three conventional reading readiness measures and two concepts of reading measures. The concepts measures were developed and piloted by the researcher. A priority in designing the tasks was minimizing the need for verbalization by providing children with a concrete situation or material. The concrete aids included observations of real people modeling reading, as well as other activities; a page of text or "secret message" to be read; four books with different amounts of print (Book 1--pictures and text; Book 2--just pictures; Book 3--just text; and Book 4--blank pages); and several vinegettes involving a package, a cardboard town, and a game.

Comparisons between age groups clearly indicated that knowledge of all concepts and skills increased significantly over the preschool years. Developmental patterns within groups were not consistent, but there was an indication that more growth occurred between the two younger groups than the two older ones. Evidence for this conclusion was based on three significant comparisons between the three- and four-year-olds as opposed to only one significant comparison between four- and five-year-olds.

A factor analysis was performed to determine the degree of unity among the entire set of variables. While relationships between all pairs of variables were statistically significant, a single factor explained a significant amount of the variation. Further analyses to determine the existence of a discernible sequence in the development of the concepts and skills showed that the group did not meet the criteria for a scalable set. There was a tendency for concepts to be acquired prior to the skills. However, this conclusion must be viewed as tentative. Results showed 71% of the children who passed four measures

passed both concepts measured, and 67% who passed three also passed both concepts, but only 38% of the group who passed two measures passed both concepts. It could be argued equally as well that this is additional evidence to support the absence of a fixed sequence in the acquisition of these print awareness skills and concepts.

Hiebert was cognizant that environmental factors and cultural influences might affect the development of print awareness. Groups growing up at different times and in different places are exposed to different stimuli. Scottish (Reid, 1966), New Zealand (Clay, 1969), and American Indian (Oliver, 1975) samples may have been exposed to cultural influences that affect their print awareness. Media programming and exposure may have produced a differential effect for Hiebert's subjects over those of earlier studies. Hiebert's middle-class sample from two parent homes and a common nursery school experience may, also, confound emotional stability, economic advantage and the effects of instruction with the development of print awareness in young children. Sampling procedures used in the present study certainly reduce the generalizability of the findings.

Development of the Concepts About Print Test

The most extensive, and perhaps the most important, research concerning the development of print awareness has been done by Marie Clay (1972) in New Zealand. She recorded samples of the reading behavior of 100 five-year-olds, at weekly intervals, for a year. From the data recorded she was able to identify several stages the prereader passed through as his initial confusion decreased and he was able to find print to match his vocal expressions. This study also provided the data Clay used to develop the Concepts About Print Test (CAP). The test

uses a child's storybook entitled Sand which the subject is asked to help the administrator read. The test is administered in an informal situation which requires ten to fifteen minutes. As the book is read orally by the administrator, the child responds to twenty-four questions designed to measure his level of print awareness. The questions are designed to uncover concepts to be learned and confusions to be untangled. Recalling that many research studies have found perceptual training programs using puzzles, arranging blocks, painting and writing numbers to be insignificant in boosting reading achievement, Clay (1979) advocates that preparation for reading be done directly with printed language. Traditional readiness tasks provide no information about the child's knowledge of directionality, space formats, and punctuation cues. These concepts about print are vitally important in the reading process, but they can only be assessed when children are exposed to lines of print. In the CAP test situation, the child's strengths and weaknesses are revealed as he interacts with the print. Close observation of this interaction can assist the teacher in structuring tasks to meet individual needs of children. Thus, the test's greatest value lies in it diagnostic potential.

Clay reported a Kuder Richardson reliability coefficient of 0.95 in her normalization study of the CAP test. Correlational analysis with Word Reading (composed of high frequency words from the adopted reading materials) for one hundred children of 6.0 years yielded a coefficient of 0.79.

CAP--Related Research in the United States

During the last decade, research in the United States has supported Clay's conclusions regarding the importance of print awareness in the early stages of reading. Investigations featuring different methodologies and a variety of tasks, to assess the child's understanding of concepts about print, have provided evidence to substantiate her findings. As she predicted, beginning readers (Blachowicz, 1978; Kovalcik, 1977; Teale, 1978), and readers with one or more years of reading instruction (Harlin, 1981; Ryan, McNamera, and Kenney, 1977) appear to possess varying levels of print awareness. As educators have become more cognizant of the importance of print related knowledge, the need for instruments and procedures to assess print awareness has increased. One of the few instruments designed to help educators systematically examine a child's concepts about print and gain insights into the reading process is Clay's Concepts About Print Test. Since the normalization data for this test were based on the performance of children of a different cultural heritage, it was important to test its validity and reliability for use with American children. Several researchers have recently published such evidence.

In 1978, Zinck (Johns, 1980) reported that subjects who use "book language" tended to score better on CAP than on the Boehm Test of Basic Concepts and the Metropolitan Readiness Test. She based her conclusion on language samples of 167 kindergarten children. For analysis, the language samples were categorized as labeling, conversational, or more structured book language. Although the categories were simplistic, analyses revealed definite performance trends.

Day and Day (1979a) correlated scores on the CAP with the Metropolitan Readiness Test. Their subjects consisted of 56 kindergarten students from four public schools in a southwestern suburban community of about 50,000 residents. From a list of 265 children, those who could not speak English, those who were six years old before September 1, 1977, and those with perceptual or motor handicaps were excluded. Then, 75 children were randomly selected as participants. Parents of 61 of these children granted permission for their children to participate in the study. Five children were available for the first data collection only, so they dropped from the group, leaving a total sample of 56 children. Five boys and five girls (18%) were from a minority group.

The CAP was administered three times during the kindergarten year. In September of the following year, in first grade, it was administered a fourth time, along with the Metropolitan Readiness Test. By this time, the sample had decreased to 51. No information was given about the ethnic origin of the subjects who were dropped.

Reliability coefficients were calculated for the CAP. Spearman-Brown estimates ranged from 0.84 to 0.88. Kuder Richardson (20) coefficients for the four administrations were 0.83, 0.83, 0.86, and 0.92 respectively. Correlations between the CAP, the Metropolitan Readiness Subtests, and the Metropolitan Readiness Prereading composite scores were all positive. The researchers concluded that reliability and validity of the CAP seem to be similar for American and New Zealand children. They also stated that the high correlations of the CAP with the Metropolitan Readiness Test indicate the potential usefulness of

the CAP in early identification of children who may experience difficulty in learning to read.

Further analysis of the CAP scores revealed a significant time of testing effect. A multiple comparison test showed significant gains for each administration of the test. The mean for the average child at the end of kindergarten was 10.8. The mean for the last administration was 13.0, still less than half of the possible score. These data suggest that some of the concepts about print assessed by this test may not be crucial prerequisites for beginning reading, but may, instead, develop concurrently as beginning reading skills are learned (Doehring and Aulls, 1979; Hiebert, 1981; Johns, 1980).

Day, Day, Hollingsworth, and McClelland (1980c) also found significant sex differences in their CAP data. Correlations between age, in months, and CAP scores also significantly favored females. Pearson product-moment correlations coefficients were 0.49, 0.44, 0.35, and 0.41, respectively, and all were significant. Similar coefficients for males were 0.09, 0.20, 0.16, and 0.02, none of which were significant. Since measures of skewness between the sexes were nonsignificant, and mean age for both sexes were the same, the researchers suggested differences might reflect different critical periods of skill acquisition. They could also reflect sex-related motivational influences on the development of prereading skills.

In follow-up analyses of the same data set, Day and Day (1980a) examined the internal structure of the CAP. An item analysis showed several items with little or no, variability. Item one was missed only once during the four administrations. Item 18 was never answered correctly. Items 12 and 14 were answered correctly only once. Item 21

had the lowest variability other than zero. Each item was treated as a variable for the four administrations and factor analyzed. Similar factor structures were subjectively grouped to reveal four patterns: (1) Print-direction concepts; (2) Letter-word concepts; (3) Advanced-print concepts; and (4) Book-orientation concepts.

The findings indicated that Book-orientation concepts had already been acquired by most of the subjects at the beginning of kindergarten. Advanced-print concepts, on the other hand, were understood by only a few in first grade. Most of the subjects acquired Print-direction concepts and Letter-word concepts somewhere in between. The researchers felt that the trend toward consistent grouping of items in the analyses supported the face validity of the CAP items.

Day and Day recommended caution in the application of their results because of several methodological shortcomings. First, the factors may not be stable because the analyses were planned to produce a large number of factors, the variables were dichotomous, and the sample was relatively small. Secondly, pattern similarities may be due partially to repeated testings of the same subjects.

Most recently, Johns (1980) used the CAP test to assess children's concepts about print at the end of first grade. Sixty white, middle-class subjects were evenly divided into three groups by reading level. Above average, average, and below average readers' CAP scores were correlated with several achievement measures including February scores from the Metropolitan Survey Test, Form JS and May scores from the Metropolitan Achievement Tests, Primary 1 (Form F), as well as the Gates-MacGinitie, Primary A (Form 1). The reseacher reported significant differences between the three groups in the expected direction on

all measures (Johns, 1980). He found no significant sex differences or interactions between reading group membership and sex of subject. Using the four patterns identified by Day and Day, Johns found that above-average readers were superior to below-average readers in Print-direction concepts, Letter-word concepts, and Advanced-print concepts.

Johns' findings revealed fairly consistent groupings of items into the four patterns identified by Day and Day. However, because the Day and Day sample was small, Johns recommends that results be verified by additional studies. Johns also raises questions about the CAP administration procedures. He felt that the tasks were not set up to actively engage the subjects' visual attention, and as a result ". . . more than a few subjects assumed the passive role of listener as the CAP was administered" (p. 546). He also felt that some of the tasks were not clearly understood, especially by the below average readers. It is interesting to note that Johns' concerns about the CAP may, in reality, be a reflection of a more sensitive observation of the young child's level of print awareness. Such concerns simply reinforce the diagnostic value of the CAP.

Summary

Linguistic and visual concepts about print, as well as the reading process itself, mystify children. Children are confused in the initial stages of reading instruction because their knowledge of reading-related concepts and their language skills for thinking and talking about written language are inadequate. Though this confusion is generally ignored in the teaching of reading, it is a major problem for many children. The cognitive clarity theory of learning to read has been proposed to explain

the confusion that results from the mismatch between the child's linguistic capabilities and the demands of the reading task.

Case studies of early readers show that children begin reading at various levels of print awareness. Studies initiated after a year or more of reading instruction substantiate this. When the experimental setting presented print in a meaningful context, verbal performance increased. The data show that most children can demonstrate knowledge of concepts about print that they are unable to verbalize.

How does print awareness develop? Is it a unitary process, a developmental hierarchy of skills, or the haphazard development of a set of unrelated skills? What, if any, concepts about print are prerequisite for reading? Answers to these questions are not available at the present time. A comprehensive explanation of the developmental nature of print awareness is not consistently supported. Contradictory findings make definitive conclusions impossible.

Curriculum decisions and instructional applications based on empirical data have, also, been problematic. Generalizations have been limited by the wide variety of methodologies and research procedures used. Many studies had very small samples drawn from narrowly defined socioeconomic strata. Minority groups were excluded from many samples. When they were included, their proportion of the total sample was minimal. Another difficulty was the variability of the task requirements. Some tasks were so complex, it was impossible to determine whether subjects did not know the skill or could not do the task.

Few instruments for assessing the child's grasp of concepts about print are available. One such instrument is the CAP. It is currently

being validated for use with American children. Perhaps it can help provide definitive answers to some of the questions raised. Questions about the nature of the development of concepts about print in young children and how that developmental process can be facilitated in the kindergarten classroom await clarification.

CHAPTER III
COLLECTION AND TREATMENT OF DATA

Empirical evidence, cited in chapter II, has consistently linked print awareness and reading achievement. This study was designed to determine the significance of print awareness for predicting reading readiness in kindergarten and reading achievement in first grade. Another purpose was to study the longitudinal development of print awareness in a group of children over the two-year period. The intent was to clarify some of the inconsistencies regarding the nature of that development. A final purpose was to investigate the construct validity of a new measure of reading achievement, TERA, by examining its relationship with commonly used measures of reading achievement and print awareness.

Setting of the Study

Alachua County Board of Public Instruction granted permission for this study to be conducted at one of its elementary schools. The school is located in northeast Gainesville, Florida. It had a student population of 719. Minority groups, predominately black, made up 29.8% (214 students) of the total enrollment. Mothers of about 50% of the students were employed outside the home. Many of the younger children were transported from their classes to nursery schools for several hours a day to wait for parents to finish work and pick them up. Approximately 45% of the students also had divorced parents.

Thirty-one percent (223 students) qualified for either free or reduced-price lunch. The school also participated in a federally subsidized breakfast program.

The attendance area that served the school was designed to maintain a district-wide racial balance. For this reason, the students attending the school lived in several communities; about 39% (285) lived in the immediate vicinity, so they walked to school; about 36% (260) were transported from a relatively new housing development in the northwest section of the city; and 20% (144) were transported from the inner city and from a northwest area where there were several low rent apartment complexes. The remaining 5% (26) students were physically impaired students who were transported from within Alachua County and six surrounding counties.

The student population served by the target school exemplified intellectually stratified ability levels. Results from the Otis-Lennon School Ability Test, Primary II, Form-R (1979) administered to all second graders during the 1980-81 school year followed a normal distribution. The mean SAI (School Ability Index) score for this group was 102.6 with a standard deviation of 15.4 (Administrators Data Summary, 1981). The standardization data for the test showed a mean of 100 and a standard deviation of 16.0. Since the standard error reported for the test is 4.1, it appeared that the second grade scores were representative of the population at large. A comparison of fifth grade scores yielded similar results. While no ability measure was available for the other grade levels, the evidence indicates that ability levels of the student population were

stratified. At least two grade levels had ability levels that were representative of the elementary population at large, since their SAI scores approximate the normal bell-shaped distribution.

The Sample

The sample in this study included all of the first grade students who had attended the target school since entry into kindergarten in August, 1980. These children were all five years old on or before December 1, 1980. Out of 101 children who entered kindergarten in August, there were 82 still in the school at the end of the year. The following September, only 63 of the children returned to enter first grade. One child's parents refused permission for her to be a participant in the study. The remaining 62 children were the subjects in this study. The group was composed of 47 (75.8%) white children and 15 (24.2%) children from ethnic minorities. The sex and racial make-up of the participants are summarized in Table 3-1.

Table 3-1

Sex and Race of Participants in the Study

	Female		Male		Total	
	Number	%	Number	%	Number	%
White	21	33.9	26	41.9	47	75.8
Minority	6	9.7	9	14.5	15	24.2
Total	27	43.6	35	56.4	62	100.0

Sources of Data Collection

PREP educational screening is required for all kindergarten students during the first eight weeks of the school year. Currently, eight instruments, including the CAP, make up the test battery.

Florida Language Profile (Subtests)

(1) Rote Counting
(2) Size-Quantity Concepts
(3) Lower Case Letter Identification
(4) Number Recognition
(5) Counting Objects

Other Tests

(6) Concepts About Print, Sand
(7) Alachua County Phonemic Segmentation
(8) Florida Language Screening System (Speech)

The Florida Language Profile (Wolking, Nancarrow, and Ehrhardt, 1971-1973) was developed and normed in the Alachua County school system. Results from this test can be used to select children for special programs or to individualize instruction for each child, and to evaluate progress or instructional effectiveness. There are separate norms for kindergarten and first grade for three testing periods--fall, winter, and spring. Two sets of norms are reported for each aspect of the test: Accuracy and Frequency Correct/Incorrect. The record sheet is designed to record three complete administrations of the test. The normalization data were derived from performance of about 1,500 children in Alachua County from 1971-1973.

Concepts About Print, Sand (Clay, 1979) provided a measure of print awareness in an informal test situation requiring the subject to interact with written language. It was preferred because it samples multiple abstract concepts in a natural situation with a concrete stimulus (Dewitz and Stammer, 1980; Downing, 1967; Hiebert, 1978). It consists of 24 questions that are asked as the examiner reads a storybook, Sand, to the child. The questions are designed to measure knowledge of the following language and visual concepts about print:

1) print can be turned into speech to convey a message, 2) pictures aid that message, 3) directionality and mechanical constraints of print, 4) word boundaries, 5) "letter" and "word" are not the same. The test was developed and standardized by Marie Clay (1972) in New Zealand. She reported a KR reliability coefficient of 0.95, based on 40 urban children aged 5.0 to 7.0 years. A correlation with word meaning for 100 children at 6.0 years yielded a coefficient of 0.79. Studies conducted in this country with 56 kindergarten children (Day and Day, 1979a) yielded test-retest reliability coefficients of 0.73-0.89 and corrected split-half coefficients of 0.84-0.88. These researchers also reported a correlational coefficient of 0.61 with the Metropolitan Readiness Test (Nurss and McGauvran, 1976) and 0.79 with word meaning. Additional evidence supporting the validity and reliability of CAP for use with first graders (Johns, 1980) and primary-aged children (Harlin, 1981) has recently been published.

The Alachua County Phonemic Segmentation Test (1975) was adapted by William Powell from a "Report of the Results of the Screening Test Developed by the Early Decoding Strategies Project" directed by Julia Osborn and Evelyn Rothstein. The project was undertaken in the Horace Mann-Lincoln Institute for School Experimentation at Teachers College, Columbia University. The test is administered individually and requires five to ten minutes. It consists of seven picture cards, two practice items and five test items. The pictures are shown one at a time. The examiner says the name of the picture and tells the child the initial sound of the pictorial stimulus for both practice items. Then as the pictures of the test items are shown, the child is asked

to give the initial sound. Letter names are not accepted as correct answers. If a letter name is given, the tester may say, "Can you tell me the sound, not the letter, the word begins with?" The seven picture cards are always presented in the following order: cat, valentine, mouse, fox, jet, apple, and tiger. Directions may be repeated throughout the test as needed for clarification. Three correct answers are required to pass the test.

The Florida Language Screening System (FLASC) was developed in 1974-76 by the speech department at the University of Florida and was standardized in Florida schools under the auspices of the State Department of Education. FLASC tasks were modeled after the Illinois Test of Psycholinguistic Abilities, the Peabody Picture Vocabulary, and the Agent-Action Test. Correlations between the FLASC and standardized follow-up tests (Utah Test of Language Development, Illinois Test of Psycholinguistic Abilities, and the Preschool Language Scale), item discrimination between high and low scores, range of item difficulty, and item consistency were all significant beyond the 0.05 level. Further correlational analysis to confirm inter-tester reliability yielded a Rho score of 0.714. The FLASC measures both receptive and expressive use of five different language areas:

1. Phonology--the comprehension and formulation of the sound system of spoken language
2. Lexology--the comprehension, retrieval and production of the vocabulary items (lexemes) of language
3. Morphology--the comprehension and production of morphemes--the smallest units of language which have meaning

4. Tactology--the comprehension and use of the grammatical system of language (syntax)
5. Semology--the understanding and appropriate use of the meaning system of language

The Metropolitan Readiness Test, Level II, Form P (Nurss and McGauvran, 1976) was used to assess reading readiness at the end of kindergarten. It is a nationally known test, widely used for this purpose in late kindergarten and early first grade. It was administered in April, 1981, as a part of the county-wide testing and evaluation program. A split-half reliability coefficient of 0.94 was reported for the prereading composite score. In addition, it has been used in previous research to verify the validity and reliability of the CAP for a sample of 51 in the United States. In that study, correlations between the MRT prereading composite score and the total CAP score ranged from 0.61 to 0.72 (Day and Day, 1979a).

Reading achievement at the end of first grade was assessed with scores from several measures. One of the measures used was the Metropolitan Reading Survey Test, Primary 1, Form JS (Prescott, Balow, Hogan, and Farr, 1978). This test, Metro '78, was administered in April of this year as a part of the county-wide testing and evaluation program. A reliability coefficient (KR - 20) of 0.96 has been reported.

Recent publication of a new test, Test of Early Reading Ability (Reid, Hresko, and Hammill, 1981), provided an added dimension for the assessment of reading achievement. Its content combines traditional reading tasks with concepts about print tasks identified in research from 1972-1979. TERA assesses three components of early reading ability in children

from three to seven years of age. The 50-item test measures the child's ability to 1) find meaning in print, 2) learn the alphabet and its uses, and 3) respond to the arbitrary conventions of print. Internal reliability of the items was investigated using Coefficient Alpha. Except for the three year olds, the coefficients were greater than or equal to 0.90. Small standard errors of measurement support the reliability of TERA. In all age groups, the SEm is equal to approximately two raw score points (range from 1.59-2.20). Two administrations of the TERA, with a two-week interval between testings, yielded test-retest reliability coefficients for the differing age groups of 0.85, 0.92, 0.94, 0.92, and 0.82 respectively. Criterion-related and construct validity was established by correlating TERA scores with a variety of reading, school readiness, intelligence, and language tests.

Collection of Data

In late September and early October of 1980, the CAP, the FLP Subtests, and the Phonemic Segmentation Test were administered to all kindergarten subjects by their classroom teachers. The teachers had participated in training sessions immediately prior to the opening of school to receive instruction and practice in administering the test. The CAP was given to all subjects a second time, in April, 1981, by the same teacher who had initially administered it in the fall.

The FLASC was administered by a certified speech therapist. FLASC scores were required for both Language/Speech and PREP screening.

During the 1981-82 school year while the subjects were in first grade, the CAP was given in September and again in April. A PREP aide, trained by the researcher, administered the test to all of the subjects.

The researcher administered the TERA to all subjects in April, 1982.

The two achievement measures, MRT and MAT, were administered by classroom teachers. In kindergarten, the students were tested in small groups of 12 to 15. The teachers at that level were assisted by volunteers and PREP aides. In first grade, the total classroom group was tested at once. Each class had 25 to 28 students, and again the teacher was assisted by a PREP aide.

Sources of data collection and a schedule of collection dates for specific behavior samples are summarized in Table 3-2.

Data Analyses

This ex post facto study required several statistical analyses to test the hypotheses posed. To determine the relationships between concepts about print, other PREP screening variables, sex, race, and study achievement, Pearson product-moment correlation coefficients were calculated. In addition, two linear regression analyses were computed to identify the best set of predictor variables for reading readiness at the end of kindergarten and reading achievement at the end of first grade.

A Lindquist Type I Anova was utilized to investigate the developmental nature of concepts about print. This special form of analysis of variance involved two factors with repeated measures

Table 3-2

Sources and Schedule of Data Collection

	Kindergarten		First Grade	
Subjects	September, 1980	April, 1981	September, 1981	April, 1982
S_1	1. Rote Counting	Metropolitan Readiness (1976)		Metropolitan Achievement (Metro '78)
S_2	2. Size Quantity			
S_3	3. Lower Case Letter Recognition			
S_4				
S_5	4. Number Recognition			
.	5. Counting Objects			TERA (1981)
.	6. Alachua County Phonemic Seg.			Meaning Alphabet Know. Print Conventions
.	7. Fla. Lang. Screening System			
.	8. Concepts About Print	CAP_2	CAP_3	CAP_4
.	Book Orientation			
.	Print Direction			GINN LEVEL
.	Letter/Word Concepts			
.				
S_{62}	Advanced Print			

across the levels of one of the factors. Figure 3-A shows a pictorial representation of the repeated measures factor. For this study, the between-subject factor was language ability. FLASC scores were used to group subjects into three ability levels. High and low groups were identified by selecting 24% of the subjects from each end of a frequency distribution of raw FLASC scores. Twenty-four percent, instead of 23% was used as the criterion for group membership because there was a natural break in the data at those points. By using that natural break, the high and low groups were equal. Each contained 15 subjects. The remaining 32 subjects, whose FLASC scores fell in the middle of the distribution, were assigned to the middle or average language ability group.

The within-subjects factor, the repeated measure, was the four administrations of the CAP. A diagram for this statistical design is presented in Table 3-3. These analyses provided data to answer the following questions. Does language ability affect performance over time (main effect of the between-subject factor)? Does the change in performance over time reflect a linear relationship between concepts about print and language ability (main effect of within-subject factor)? And finally, is the rate of change similar across all four testing periods for all language levels (interaction between factors)?

In addition to the Lindquist Type I Anova, factor and item analyses of the four administrations of the CAP were computed. These procedures were included to provide additional longitudinal evidence about the developmental strength and nature of print awareness.

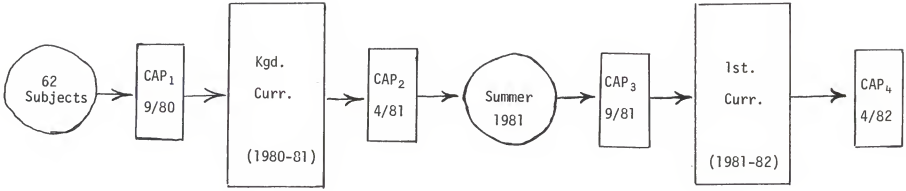

Figure 3-A. Diagram of repeated measures design.

Table 3-3

Split-plot Repeated Measures Design for Three Language Ability Groups

Language Ability	Subjects	Time of Test Administration			
		CAP_1 (kgd - 9/80)	CAP_2 (kgd - 4/81)	CAP_3 (1st - 9/81)	CAP_4 (1st - 4/82)
Low	S_1				
	S_2				
	.				
	.				
	.				
	S_{26}				
Average	S_{27}				
	.				
	.				
	.				
	S_{55}				
High	.				
	.				
	S_{62}				

The final analysis in this study was concerned with the interrelationships between reading achievement (MAT), early reading ability (TERA), and knowledge of concepts about print (CAP) for first grade. The TERA is a new test which includes tasks that sample reading behavior, as well as knowledge of printing conventions. Its construct validity was established for six- and seven-year-olds in correlational studies involving the Test of Early Language Development (Reid, Hresko, and Hammill, 1981), Metropolitan Achievement Tests (Durost et al., 1970), and the Metropolitan Readiness Test (Hildreth et al., 1969). One of the measures used in the validation study was developed as a companion test for TERA by the same authors. The MRT was revised in 1976, but no reason was given for using the earlier edition. The MAT was also revised in 1978. For these reasons, it was necessary to check the construct validity of TERA with the Metro '78. And since TERA also samples knowledge of printing conventions, it was beneficial to determine its correlation with CAP. Therefore, Pearson product-moment correlation coefficients were computed for Metro '78, TERA, and CAP scores for first grade to establish construct validity of TERA as a measure of early reading ability.

Chapter IV presents the results of the various analyses and addresses whether or not each hypothesis studied was rejected. It ends with a general discussion of the findings.

CHAPTER IV
ANALYSES OF THE DATA

This study investigated the effectiveness of knowledge of concepts about print and PREP screening variables for predicting reading readiness levels at the end of kindergarten and subsequent reading achievement at the end of first grade. It, also, monitored the longitudinal development of print awareness over a two-year period in the same groups of students. And finally, it investiaged the construct validity of a new instrument, the Test of Early Reading Ability (TERA), published in 1981.

To collect data for the study, the reading achivement of 62 students was followed from the beginning of kindergarten until the end of first grade. The students were assigned to three language ability groups based on scores from the Florida Language Screening System (FLASC) administered at the beginning of kindergarten. Students whose raw score on the FLASC fell between 29 and 36 were labeled the average group. Those students below that range made up the low group and those above made up the high group. A natural break in the data at these points placed 24%, 15 students, in the high and low groups. The remaining 52%, 32 students, formed the average group. The students were initially tested with the PREP Screening Battery, containing eight subscales. The MRT was administered at the end of kindergarten. At the end of first grade the MAT and TERA were administered. In addition the CAP was

administered four times during the two-year period, at the beginning and end of each school year. Eight hypotheses were tested using correlational analyses, regression analyses, and a split-plot repeated measures design. Statistical analyses were carried out utilizing the SAS and BMDP packaged programs. Results from the several statistical analyses are presented in this chapter.

Findings Related to the Hypotheses

Pearson product-moment correlations for the two achievement measures, the dependent variables, and ten independent predictor variables were calculated. Zero order correlations for all the variables are presented in Table 4-1. Each square in the correlation matrix has two numbers. The top number in each square is the correlation coefficient for two particular variables. The bottom number represents the significance level of the observed correlation coefficient. To locate a particular coefficient, find one variable along the vertical axis, and one along the horizontal axis. The coefficient and its probability value are found in the square where the two axes converge.

An examination of zero order coefficients showed that all of the test scores were significantly related to MRT scores (first row of the table). Probability for each of the test scores was less than the 0.05 level, which was set as the criterion for significance. Six of the eight test scores were, also, significantly related to MAT scores (column 13). The fact that many of the independent variables were as highly correlated with each other as they were with the achievement measures suggested that several of them were

Table 4-1

Correlation Matrix for PREP Screening Variables, MRT and MAT

	MRT	Sex	Race	CAP	FLASC	Ph Seq	Rote Count	Size Quan.	Name Letters	Name #	Count Obj	MAT
MRT	1.00	0.25 .047	-0.29 0.02	0.48 0.0001	0.33 0.0085	0.41 0.0010	0.54 0.0001	0.35 0.0049	0.55 0.0001	0.63 0.0001	0.44 0.0004	0.73 0.0001
Sex		1.00	- .04 0.7550	0.11 0.4052	0.03 0.3417	0.0000 1.000	0.29 0.0243	0.01 0.9654	0.13 0.3248	0.25 0.0514	0.21 0.0967	0.29 0.0225
Race			1.00	-0.34 0.0065	-0.50 0.0001	-0.38 0.0025	-0.07 0.5658	-0.20 0.1207	-0.22 0.0872	-0.20 0.1124	-0.13 0.3026	-0.16 0.2242
CAP				1.00	0.38 0.0022	0.61 0.0001	0.55 0.1113	0.20 0.0001	0.68 0.0001	0.55 0.0001	0.50 0.0001	0.48 0.0001
FLASC					1.00	0.52 0.0001	0.22 0.0841	0.35 0.0057	0.21 0.0958	0.29 0.0214	0.11 0.3747	0.32 0.0112
Ph Seq						1.00	0.49 0.0001	0.40 0.0012	0.40 0.0014	0.42 0.0006	0.38 0.0022	0.20 0.1101
Rote Count							1.00	0.08 0.5386	0.58 0.0001	0.73 0.0001	0.58 0.0001	0.55 0.0001
Size Quan.								1.00	0.09 0.4668	0.15 0.2505	0.20 0.1231	0.24 0.0586
Name Letters									1.00	0.72 0.0001	0.56 0.0001	0.58 0.0001
Name #										1.00	0.53 0.0001	0.60 0.0001
Count Obj											1.00	0.46 0.0002
MAT												1.00

supplying redundant information. Or at least, they were sampling behaviors that required the same skills. Therefore, additional analyses were necessary to determine the relative effectiveness of the variables for predicting achievement.

The following major hypotheses, stated in the null form, were tested at the 0.05 level of significance:

> Hypothesis I: There was no relationship between knowledge of concepts about print, measured by CAP, PREP screening variables, sex, race, and reading readiness, measured by the MRT, at the end of kindergarten.

A linear regression of MRT scores on the CAP scores, PREP screening variables, sex, and race was computed to test this hypothesis. Results are summarized on Table 4-2. The R^2 was equal to 0.5297, meaning that 53% of the variability in MRT scores was shared with the ten independent variables. This analysis yielded an F (10, 51) = 5.74, p = 0.0001. Since the probability of the computed F statistic was less than the 0.05 level, the null hypothesis was rejected. It was concluded that a significant linear relationship existed between the CAP, PREP screening variables, sex, race, and reading readiness at the end of kindergarten.

Table 4-2

Analysis of Variance for MRT and Ten Independent Variables

Source	DF	SS	MS	F
Model	10	4251.70	425.17	5.74*
Error	51	3774.64	74.01	
Total	61	8026.34		

An examination of the sequential F tests (Type I SS) revealed that all of the independent variables were not significant in predicting reading readiness levels. Sex, Race, CAP, Rote Counting, Size-Quantity concepts, and Naming Lower Case Letters were the significant predictors. Partial F tests (Type IV SS), which reveals the unique contribution of each independent variable, one at a time, while holding the others constant, showed that only one independent variable maintained its significance. The Size-Quantity Concepts Test was the significant variable, F (1,61) = 5.53, p = 0.023. These results are summarized on Table 4-3.

Table 4-3

Analysis of Variance for Hierarchical and Sequential Testing of Independent Variables and MRT

Source	DF	Sequential (Type I SS)	F	Partial (Type IV SS)	F
Sex	1	512.74	6.93*	72.60	0.98
Race	1	618.59	8.36*	69.77	0.94
CAP	1	1175.24	15.88*	0.05	0.00
FLASC	1	117.67	1.59	7.97	0.11
Ph Seg.	1	88.88	1.20	6.23	0.08
Rote Counting	1	646.87	8.73*	80.91	1.09
Size-Quantity	1	480.87	6.50*	409.03	5.53*
Name Letters	1	386.37	5.22*	92.94	1.26
Name Numbers	1	224.93	3.04	224.83	3.04
Count Objects	1	0.03	0.00	0.03	0.00

*$p<0.05$

To eliminate the redundant variables and find the best subset of predictor variables, a stepwise multiple regression analysis was computed. The reduced model contained two variables. The two were Size-Quantity concepts and Naming Numbers. The R^2 for this reduced model was 0.471, which meant that 47.1% of the variability in reading readiness achievement could be attributed to these two factors. The

difference between R^2 for the full and reduced models was 5.8% (52.9 - 47.1). In other words, the addition of eight variabes only increased R^2 by 5.8%. The test statistic for the reduced model was significant, F (2,59) = 26.31, p = 0.0001. Since the probability value was less than 0.05, it was concluded that the two variables in the reduced model were as effective in predicting reading readiness as the ten variables in the full model. These results are presented on Table 4-4.

Table 4-4

Analysis of Variance for MRT and Two Predictor Variables

Source	df	SS	MS	F
Regression	2	3783.42	1891.71	26.31**
Size-Quantity	1	551.32	551.32	7.67*
Name Numbers	1	2782.13	2782.13	38.69**
Error	59	4242.92	71.92	
Total	61	8026.34		

* p = 0.0075
**p = 0.0001

Hypothesis II: There was no relationship between knowledge of concepts about print, measured by CAP, PREP screening variables, sex, race, and reading achievement, measured by MAT, at the end of first grade.

The same statistical procedures used to test Hypothesis I were followed for Hypothesis II with the MAT as the dependent variable. The full model for this linear regression analysis yielded an R^2 = 0.57 with F (10,51) = 6.69, p = 0.0001. These results are summarized on Table 4-5. Therefore, as before, the null hypothesis was rejected and it was concluded that a significant linear relationship existed between the independent variables and reading achievement.

Table 4-5

Analysis of Variance for MAT and Ten Independent Variables

Source	df	SS	MS	F
Model	10	5475.29	547.53	6.69*
Error	51	4174.58	81.85	
Total	61	9649.87		

*p = 0.0001

An examination of the sequential F statistics (Type I SS) and the partial F tests (Type IV SS) showed some of the independent variables to be non-significant as predictors of reading achievement. Results from this analysis are presented on Table 4-6. Next, a stepwise regression analysis strategy was used to identify the best subset of predictor variables from the total group. The best model reduced the number of significant predictor variables to five. FLASC, Phonemic Segmentation, Rote Counting, Size-Quantity Concepts, and Naming Letters were included in the reduced model. The reduced model had R^2 = 0.545 and F (5.56) = 12.87, p = 0.0001. The difference in R^2 for the full and reduced models was 3.2% (56.7 - 53.5). Since probability of the test statistic was less than 0.05, it was concluded that the five variables in the reduced model were as effective in predicting reading achievement as the ten variables in the full model. These results are summarized on Table 4-7.

Hypothesis III A: There were no differences in levels of print awareness, measured by the total score on the CAP, for students of different language abilities, measured by the FLASC.

Table 4-6

Analysis of Variance for Hierarchical and Sequential Testing of Ten Independent Variables and MAT

Source	DF	Sequential (Type 1 SS)	F	Partial (Type IV SS)	F
Sex	1	808.83	9.88*	96.66	1.18
Race	1	202.90	2.48	4.35	0.05
CAP	1	1786.98	21.83*	87.98	1.07
FLASC	1	281.49	3.44	343.16	4.19*
Ph Seq	1	246.13	3.01	726.96	8.88*
Rote Counting	1	1073.72	13.12*	233.33	2.85
Size-Quantity	1	420.97	5.14*	243.17	4.19*
Name Letters	1	556.61	6.80*	226.96	2.77
Name Numbers	1	72.92	0.89	71.78	0.88
Count Objects	1	24.73	0.30	24.74	0.30

*p<0.05

Table 4-7

Analysis of Variance for MAT and Five Predictor Variables

Source	DF	SS	MS	F
Regression	5	5158.84	1031.77	12.87**
FLASC	1	471.94	471.94	5.88*
Ph Seq	1	798.70	798.70	9.96*
Rote Counting	1	997.33	997.33	12.44*
Size-Quantity	1	432.37	432.37	5.39*
Name Letters	1	1089.91	1089.91	13.59*
Error	56	4491.03	80.20	
Total	61	9649.87		

**p=0.0001
*p<0.05

A 3 x 4 analysis of variance with repeated measures on one factor was utilized to test for developmental performance trends. The between subjects variable for this Lindquist Type I Anova had three levels corresponding to three language groups. The within subjects factor represented the four CAP administrations.

Table 4-8 presents all marginal means across the four administrations of the CAP for the three language groups.

Table 4-8

Cell and Marginal Means for Total Score Performance on Four Administrations of the CAP by Three Language Groups

Administration Time	Groups			Marginal Means
	Low	Average	High	
1	3.20	5.19	6.33	4.98
2	14.60	16.19	19.47	16.60
3	15.67	17.06	20.40	17.53
4	19.33	21.97	22.47	21.45
Marginal Means	13.20	15.10	17.17	15.14

The results of the split-plot analysis of variance are presented in Table 4-9. The main effect for group membership was significant, F (2,59) = 6.53, p = 0.0027. Hypothesis III A, therefore, was rejected and it was concluded that the level of print awareness was not the same for students of low, average, and high language ability. Hence, follow-up comparisons using the Bonferroni procedure with the error rate set at the 0.05 level of significance, per family, were conducted. Results of the follow-up comparisons, presented in Table 4-10, indicate that the significant difference was between the low and high language groups. The contrasts, Group 1 versus Group 2 and Group 2 versus Group 3, contained zero and, therefore, both hypotheses were accepted. This meant that low and average language groups performed equally well. And the same was true for the average and high language groups.

Hypothesis III B: There were no differences in levels of print awareness, measured by the total score on CAP throughout kindergarten and first grade.

Table 4-9

Analysis of Variance of Difference Between Language Groups Across Four Administrations of the CAP

Source	SS	df	MS	F
Between Subjects				
Group	472.45	2	236.22	6.53*
Subjects Within Groups	2134.36	59	36.18	
Within Subjects				
CAP	8274.88	3	2758.29	470.66*
Linear Trend	7047.60	1	7047.60	1011.66*
Quadratic Trend	941.31	1	941.31	169.25*
Cubic Trend	285.96	1	285.96	56.59*
Groups X CAP	66.59	6	11.10	1.89
CAP X Subjects Within Groups	1037.30	177	5.86	
Linear (error)	411.01	59	6.97	
Quadratic (Error)	328.15	59	5.56	
Cubic (Error)	298.13	59	5.05	

*p=0.00

Table 4-10

Comparisons of Total CAP Scores for Language Groups Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Group 1 vs Group 2	(-4.27, 0.47)	Do not reject H_o 1=2
Group 1 vs Group 3	(-7.63, -0.31)	Reject H_o 1<3
Group 2 vs Group 3	(-4.44, 0.30)	Do not reject H_o 2=3

Table 4-8 presents marginal means for the four administrations of the CAP. Means for the four administrations of the CAP were 4.98, 16.60, 17.53, and 21.45, respectively. The split-plot statistical analysis summarized in Table 4-9 indicated a significant main effect for time of test, F (3,177) = 470.66, p = 0.00. Because the probability of the computed test statistic was less than the 0.05 level of significance, Hypothesis III B was rejected. It was concluded that the levels of print awareness were not the same during kindergarten and first grade. Follow-up comparisons were conducted to identify specific differences for the time of test factor. Again, the Bonferroni procedure was used to construct confidence intervals at the 95% level. Results of the follow-up comparisons, presented in Table 4-11, revealed significant differences between the first and each successive administration of the test. In addition, significant differences existed for all contrasts, except Time 2 versus Time 3. These results indicated that improvement was steady and continuous during the kindergarten and first grade years but dropped off during the summer between.

> Hypothesis III C: There was no significant interaction between time of test and group membership on the total scores for CAP.

Table 4-9 shows the results for the interaction (Groups x CAP). This test statistic was not significant, F (6,177) = 1.89, p = 0.08. Therefore Hypothesis III C was not rejected and it was concluded that the performance trends, over time, for CAP total scores were the same for all groups.

Table 4-11

Comparisons of Total CAP Scores for Four Administrations Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Time 1 vs Time 2	(-12.72, -10.52)	Reject $H_{0_{1<2}}$
Time 1 vs Time 3	(-13.65, -11.45)	Reject $H_{0_{1<3}}$
Time 1 vs Time 4	(-17.57, -15.37)	Reject $H_{0_{1<4}}$
Time 2 vs Time 3	(-2.03, 0.17)	Do not reject $H_{0_{2=3}}$
Time 2 vs Time 4	(-5.95, -3.75)	Reject $H_{0_{2<4}}$
Time 3 vs Time 4	(-5.02, -2.82)	Reject $H_{0_{3<4}}$

Since there was a main effect for the time of test and since the variable was quantative, it was possible to test for trends in the data. Results from the trend analyses are discussed under the next hypothesis.

Hypothesis III D: There were no trends in performance on the total scores of the CAP throughout kindergarten and first grade for three language groups.

A Lindquist Type I Anova was used to partition the sums of squares effect for linear, quadratic and cubic trends in the data. Cell and marginal means for the groups were reported previously in Table 4-8. Figure 4-A presents the plot of the data and serves to pictorially clarify the relationship between group membership and performance on each administration of the CAP. The results of the trend analyses,

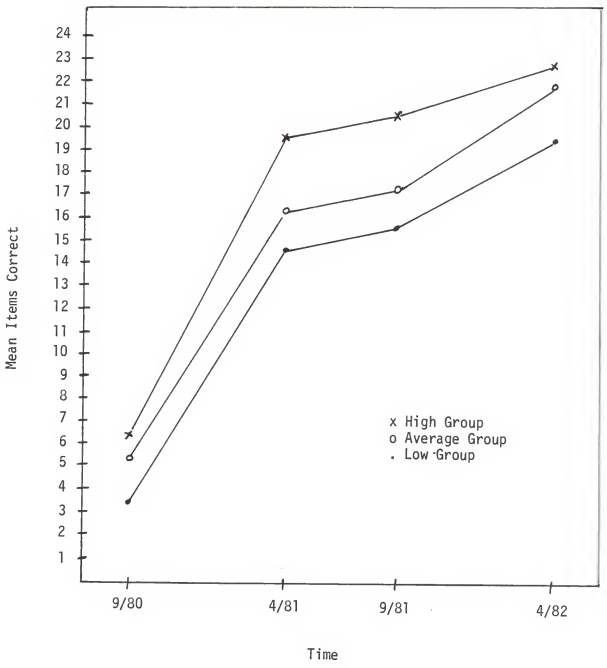

Figure 4-A. Plot of cell means summarizing the relationship between language ability and total score performance on four administrations of the CAP.

shown in Table 4-9, indicated a significant linear trend, F (1,59) = 1011.66, p = 0.00; a significant quadratic trend, F (1,59) = 169.25, p = 0.00; and a significant cubic trend, F = (1,59) - 56.59, p = 0.00. Therefore, Hypothesis III D was rejected. It was concluded that during periods of instruction, achievement increased in a linear fashion, but leveled off when instruction decreased.

Pattern I

Hypothesis IV A: There were no differences in levels of print awareness, measured by CAP-Pattern I, for students of different language abilities.

The cell and marginal means for the three language groups' performance on Pattern I are presented in Table 4-12. Table 4-13 summarizes the results of the statistical analyses for the split-plot with repeated measures design for Pattern I. The main effect for group membership or language ability was significant, F (2,59) = 3.80, p = 0.0280. Therefore, Hypothesis IV A was rejected. It was concluded that at least one of the groups scored significantly better than the others on Pattern I. Follow-up comparisons were necessary to identify the specific differences between the language groups. The Bonferroni procedure was used to construct 95% confidence intervals. Results, presented in Table 4-14, revealed that the significant difference, as before, was between the low group and the high group.

Table 4-12

Cell and Marginal Means for Four Administrations of CAR-Pattern I, Print-Direction Concepts by Three Language Groups

Administration Time	Groups			Marginal Means
	Low	Average	High	
1	0.73	1.32	1.68	1.25
2	5.27	5.84	6.80	5.94
3	6.33	6.09	7.00	6.37
4	6.87	7.00	7.00	6.97
Marginal Means	4.80	5.06	5.62	5.13

Table 4-13

Analysis of Variance of Difference Between Language Groups Across Four Administrations of CAR-Pattern I

Source	SS	df	MS	F
Between Subjects				
Group	21.33	2	10.66	3.80*
Subjects Within Groups	165.53	59	2.81	
Within Subjects				
CAP	1148.21	3	382.74	253.78**
Linear Trend	875.43	1	875.43	451.41**
Quadratic Trend	247.25	1	247.25	167.09**
Cubic Trend	25.53	1	25.53	23.10**
Group X CAP	12.21	6	2.04	1.35
CAP X Subjects Within Groups	266.95	177	1.51	
Linear (Error)	114.42	59	1.94	
Quadratic (Error)	87.31	59	1.48	
Cubic (Error)	65.22	59	1.11	

* p=0.03
**p=0.00

Table 4-14

Comparisons of CAP--Pattern I Scores for Three Language Groups Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Group 1 vs Group 2	(-0.92, 0.40)	Do not reject $H_{0_{1=2}}$
Group 1 vs Group 3	(-1.54, -0.05)	Reject $H_{0_{1<3}}$
Group 2 vs Group 3	(-1.22, 0.10)	Do not reject $H_{0_{2=3}}$

Hypothesis IV B: There was no differences in levels of print awareness, as measured by CAP--Pattern I throughout kindergarten and first grade.

Marginal means for Pattern I scores across the four administrations of CAP were presented previously in Table 4-12. The test for statistical significance of the main effect for time of test was found to be significant, F (3,177) = 253.78, p = 0.00. See Table 4-13 for a summary of the split-plot analysis of variance results. Therefore, Hypothesis IV B was rejected and it was concluded that performances were not the same on CAP--Pattern I for this two year interval. Follow-up comparisons, using the Bonferroni, were carried out to identify specific differences for the time of test. Confidence intervals of expected population parameters are shown on Table 4-15. As expected, there were significant differences between the first and each successive administration of Pattern I. There was also a significant difference between the second and fourth administrations. The contrasts Time 2 versus 3 and Time 3 versus Time 4 contained zero in the interval and, therefore, hypotheses for both contrasts were not rejected.

Table 4-15

Comparisons of CAP-Pattern I Scores for Four Administrations Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Time 1 vs Time 2	(-5.24, -4.12)	Reject $H_{0_{1<2}}$
Time 1 vs Time 3	(-5.67, -4.55)	Reject $H_{0_{1<3}}$
Time 1 vs Time 4	(-6.27, -5.15)	Reject $H_{0_{1<4}}$
Time 2 vs Time 3	(-1.42, 0.13)	Do not reject $H_{0_{2=3}}$
Time 2 vs Time 4	(-1.59, -0.47)	Reject $H_{0_{2<4}}$
Time 3 vs Time 4	(-1.06, 0.06)	Do not reject $H_{0_{3=4}}$

Hypothesis IV C: There was no interaction between time of test and group membership on the CAP-Pattern I scores.

Results for the interaction (Groups x CAP) are shown on Table 4-12. The statistical test was not significant, F (6,177) = 1.35, P = 0.2377. Therefore, Hypothesis IV C was not rejected. It was concluded that developmental trends on CAP-Pattern I were similar for all groups.

Hypothesis IV D: There were no trends in performance on CAP-Pattern I throughout kindergarten and first grade for the three language groups.

Figure 4-B depicts the performance curves of cell means previously reported in Table 4-12. Results from the trend analyses are summarized in Table 4-13. The calculated test statistic for linearity

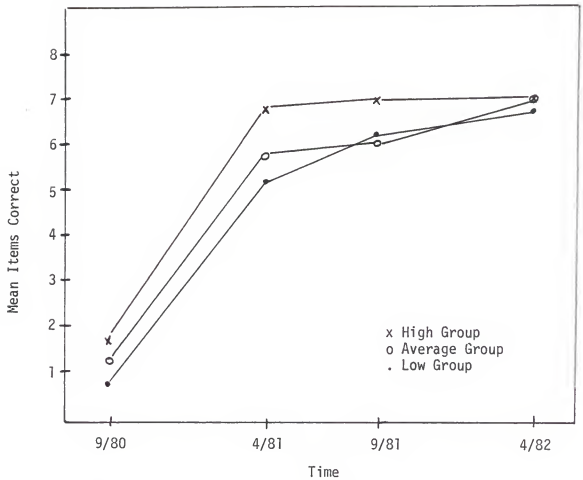

Figure 4-B. Plot of cell means summarizing the relationship between language ability and performance on four administrations of CAR-Pattern I.

was significant for CAP-Pattern I, $F = (1,59) = 451.41$, $p = 0.00$. A significant quadratic trend was also significant, F (1,59) = 167.09, $p = 0.00$. And finally a significant cubic trend was revealed, F (1,59) = 23.10, $p = 0.00$. So, Hypothesis IV D was rejected, and it was concluded that linear, quadratic and cubic trends were present in CAP-Pattern I performances. Conclusions from the trend analysis for CAP-Pattern I and total CAP scores were similar.

Pattern II

> Hypothesis V A: There were no differences in levels of print awareness, measured by CAP-Pattern II, for students of different language abilities.

Table 4-16 presents cell and marginal means across four administrations of the CAP-Pattern II for the three language groups. Results of the split-plot repeated measures Anova are summarized in Table 4-17. The main effect for group membership was significant, F (2,59) = 8.66, $p = 0.005$. Hypothesis V A, therefore, was rejected. It was concluded that group membership affected performance on CAP-Pattern II. Since the hypothesis was rejected, follow-up comparisons, using the Bonferroni procedure, were utilized to detect specific differences between the three language groups. Results from the follow-up comparisons are presented on Table 4-18. The contrast Group I versus Group 2 and the contrast Group 1 versus Group 3 did not contain zero; therefore, both hypotheses were rejected. It was concluded that the average and high language groups scored equally well on CAP-Pattern II, but the low group had scores significantly lower than both of the higher groups.

Table 4-16

Cell and Marginal Means for Four Administrations of CAP--Pattern II, Letter-Word Concepts, by Three Language Groups

Administration Time	Groups			Marginal Means
	Low	Average	High	
1	0.93	2.13	2.80	2.00
2	4.93	5.22	5.87	5.31
3	4.33	5.38	5.93	5.26
4	5.47	5.91	6.00	5.82
Marginal Means	3.92	4.66	5.15	4.60

Table 4-17

Analysis of Variance of Difference Between Language Groups Across Four Administrations of CAP--Pattern II

Source	SS	df	MS	F
Between Subjects				
Group	46.57	2	23.28	8.66*
Subjects Within Groups	158.61	59	2.69	
Within Subjects				
CAP	511.15	3	170.38	67.04*
Linear Trend	352.69	1	352.69	239.93*
Quadratic Trend	122.68	1	122.68	131.91*
Cubic Trend	46.00	1	46.00	70.76*
Group X CAP	10.34	6	1.72	1.69
CAP X Subjects Within Groups	180.58	177	1.02	
Linear (Error)	86.95	59	1.47	
Quadratic (Error)	55.28	59	0.94	
Cubic (Error)	38.35	59	0.65	

*p=0.00

Table 4-18

Comparisons of CAP-Pattern II Scores for Three Language Groups Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Group 1 vs Group 2	(-1.39, -0.09)	Reject H_0 $1<2$
Group 1 vs Group 3	(-1.99, -0.47)	Reject H_0 $1<3$
Group 2 vs Group 3	(-1.14, 0.16)	Do not reject H_0 $2=3$

Hypothesis V B: There were no differences in levels of print awareness, measured by CAP-Pattern II, throughout kindergarten and first grade.

Marginal means for the three language groups across the four administrations of CAP-Pattern II are shown on Table 4-16. A significant main effect for time of test, F (3,177) = 67.04, p = 0.0, is revealed in the data summarized on Table 4-17. For this reason, Hypothesis V B was rejected, and it was concluded that performances during the kindergarten and first grade years were characterized by differences. Pairwise comparisons were necessary to locate specific differences in performances during the two-year interval. Results of these comparisons, presented in Table 4-19, indicated that there were significant differences between the first administration and each successive administration of CAP-Pattern II. In addition, a significant difference in CAP-Pattern II scores was discovered between the second and fourth administration. The contrasts, Time 2 versus Time 3 and Time 3 versus Time 4, contained zero in the confidence intervals, so hypotheses for both were rejected.

Table 4-19

Comparisons of CAP--Pattern II Scores for Four Administrations Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Time 1 vs Time 2	(-3.78, -2.84)	Reject H_o 1<2
Time 1 vs Time 3	(-3.72, -2.78)	Reject H_o 1<3
Time 1 vs Time 4	(-4.29, -3.35)	Reject H_o 1<4
Time 2 vs Time 3	(-0.41, 0.53)	Do not reject H_o 2=3
Time 2 vs Time 4	(-0.98, -0.04)	Reject H_o 2<4
Time 3 vs Time 4	(-1.04, 0.10)	Do not reject H_o 3 = 4

Hypothesis V C: There was no interaction between time of test and group membership on CAP--Pattern II scores.

The statistical test for the interaction (Groups x CAP) was not significant, F - (6,177) = 1.69, p = 0.1329. Therefore, it was concluded that performance on CAP--Pattern II, over time, was the same for all language groups.

Hypothesis V D: There were no trends in performance on CAP--Pattern II throughout kindergarten and first grade for three language groups.

The cell means for CAP--Pattern II were previously reported on Table 4-16. Performance curves of these data for the three groups are depicted in Figure 4-C. Trend analyses results, presented on Table 4-17, indicated a significant linear trend, F (1,59) = 239.93, p = 0.00;

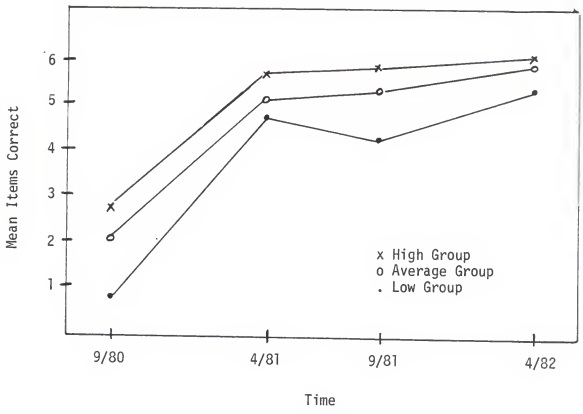

Figure 4-C. Plot of cell means summarizing the relationship between language ability and performance on four administrations of CAP-Pattern II.

a significant quadratic trend, F (1,59) = 131.91, p = 0.00; and a significant cubic trend, F (1,59) = 70.76, p = 0.00. Therefore, Hypothesis V D was rejected, and it was concluded that linear and curviliniar trends were present in the CAP--Pattern II performance of all language groups.

Pattern III

Hypothesis VI A: There were no differences in levels of print awareness, measured by CAP--Pattern III, for students of different language abilities.

The cell and marginal means for the three language groups across the four administrations of the CAP--Pattern III are presented on Table 4-20. Results of the split-plot analyses of variance are summarized in Table 4-21. The test for statistical significance for the main effect of group membership was significant, F (2,59) = 5.86, p = 0.0048, and Hypothesis VI A was rejected. However, since an interaction between language ability and time of test was found to be significant, a test for the specific differences between groups was inappropriate. Therefore, simple effects, which indicate differences between groups for each administration, were computed and are discussed under Hypothesis VI C.

Table 4-20

Cell and Marginal Means for Four Administrations of CAP--Pattern III, Advanced-Print Concepts, by Three Language Groups

Administration Time	Groups			Marginal Means
	Low	Average	High	
1	0.13	0.06	0.07	0.08
2	1.73	2.31	3.87	2.54
3	2.13	2.72	4.47	3.00
4	4.00	6.06	6.47	5.66
Marginal Means	2.00	2.79	3.73	2.82

Table 4-21

Analysis of Variance of Difference Between Language Groups Across Four Administrationsof CAP--Pattern III

Source	SS	df		F
Between Subjects				
Group	88.71	2	44.35	5.86*
Subjects Within Group	446.49	59		
Within Subjects				
CAP	810.16	3	270.00	147.01*
Linear Trend	786.40	1	786.40	490.38*
Quadratic Trend	0.29	1	0.29	0.15
Cubic Trend	23.48	1	23.48	11.89*
Group X CAP	51.51	6	8.58	4.67*
Diff. in Linear Trend	28.59	2	14.29	8.91*
Diff. in Quadratic Trend	21.40	2	10.70	5.54*
Diff. in Cubic Trend	1.51	2	0.76	0.38
CAP X Subjects Within Groups	325.14	177		
Linear (Error)	94.61	59		
Quadratic (Error)	114.01	59		
Cubic (Error)	116.51	59		

*p=0.00

Hypothesis VI B: There were no differences in levels of print awareness, measured by CAP--Pattern III, throughout kindergarten and first grade.

Table 4-20 presented marginal means for the language groups on the four administrations of the CAP--Pattern III. The results of the split-plot with repeated measures anova, summarized in Table 4-21, indicated a statistically significant main effect for time of test, F (3,177) = 147.01, p = 0.0002, and Hypothesis VI B was rejected. However, since an interaction between group membership and time of test was found to

be significant, a test for differences between the four test administrations was inappropriate. Consequently, simple effects which reveal differences between groups on each administration of the CAP--Pattern III were analyzed and are discussed under the next hypothesis.

> Hypothesis VI C: There was no significant interaction between time of test and group membership on the CAP--Pattern III scores.

The results shown on Table 4-21, previously presented, indicated a significant interaction between group membership and time of test, F (6,177) = 4.67, p = 0.0002. Hypothesis VI C was rejected. However, since the interaction was significant, follow-up analyses were appropriate to identify specific differences between language groups for each administration. Therefore, an analysis of variance for each separate administration of CAP--Pattern III by group were calculated.

> Hypothesis VI C-1: There were no differences between language groups on the first administration of the CAP--Pattern III.

Cell means for the low, average, and high language groups on the first administration of the CAP--Pattern III were 0.13, 0.06, and 0.07, respectively. The test statistic for the simple effects of group differences for time of test, presented on Table 4-22, was not statistically significant, F (2,236) = 0.008, $p < 0.05$. Therefore, failure to reject Hypothesis VI C-1 resulted in the conclusion that no differences between language groups were discovered on the first administration of CAP--Pattern III.

> Hypothesis VI C-2: There were no differences between language groups on the second administration of the CAP--Pattern II

Table 4-22

Analysis of Variance of Difference Between Groups by Time of Test for CAP-Pattern III

Source	df	SS	MS	F
Between Subjects				
Groups @ Time 1	2	0.055	0.0275	0.008
Groups @ Time 2	2	37.813	18.907	5.78*
Groups @ Time 3	2	46.065	23.032	7.04*
Groups @ Time 4	2	59.702	29.851	9.13*
Error	236		3.27	

*$F_{(2,236),\ \alpha=0.05}=3.04$

The cell means for low, average, and high language groups were 1.73, 2.31, and 3.87, respectively. The test statistic results for simple effects on the second administration, presented on Table 4-22, indicated a statistically significant difference between groups, $F_{(2,236)} = 5.78$, $p < 0.05$. Hypothesis VI C-2 was, therefore, rejected and it was concluded that language ability differentially influenced student performance on the second administration of CAP-Pattern III.

Hence, follow-up comparisons, using the Bonferroni procedure set at the 0.05 level of significance, per family, were calculated and results are presented on Table 4-23. The contrasts Group 1 versus Group 3 and Group 2 versus Group 3 did not contain zero in the confidence intervals, so both hypotheses were rejected. It was concluded that students with high language ability performed significantly better than those with low and average language ability. In addition, students of low and average language ability performed equally well.

Table 4-23

Comparisons of CAP-Pattern III Scores for Three Administrationsby Language Groups Using the Bonferroni Procedure

Time of Test	Comparison	Confidence Interval	Decision
4/81	Group 1 vs Group 2	(-1.27, 0.11)	Do not reject $H_{o_{1=2}}$
	Group 1 vs Group 3	(-2.93, -1.33)	Reject $H_{o_{1<3}}$
	Group 2 vs Group 3	(-2.24, -0.86)	Reject $H_{o_{2<3}}$
9/81	Group 1 vs Group 2	(-1.28, 0.10)	Do not reject $H_{o_{1=2}}$
	Group 1 vs Group 3	(-3.13, -1.53)	Reject $H_{o_{1<3}}$
	Group 2 vs Group 3	(-2.44, -1.06)	Reject $H_{o_{2<3}}$
4/82	Group 1 vs Group 2	(-2.75, -1.37)	Reject $H_{o_{1<2}}$
	Group 1 vs Group 3	(-3.40, -1.80)	Reject $H_{o_{1<3}}$
	Group 2 vs Group 3	(-1.23, 0.15)	Do not reject $H_{o_{2=3}}$

Hypothesis VI C-3: There were no differences between language groups on the third administration of the CAP-Pattern III.

For the third administration of the CAP-Pattern III, cell means were 2.13, 2.72, and 4.47, for the low, average, and high language groups, respectively. The test statistic, presented on Table 4-22, indicated a significant simple effect for difference between groups on the third administration of CAP-Pattern III, F (2,236) = 7.04, $p <$ 0.05. So, Hypothesis VI C-3 was rejected and it was concluded that language ability differentially affected student performance on CAP--Pattern III at the beginning of first grade. As before, with the second administration, follow-up comparisons were conducted. Results,

presented on Table 4-23, indicate that group differences on this administration were similar to the second administration. Again, the low and average groups performed equally well, but the high group, as before, outperformed both lower groups. Hypotheses for the contrast, Group 1 versus Group 3, and the contrast, Group 2 versus Group 3, were rejected because neither confidence interval contained zero. While Group 1 always had the lowest scores, they were not significantly lower than Group 2 scores. Group 3, on the other hand, always had the highest scores, and they were significantly higher than the scores from the other two groups.

> Hypothesis VI C-4: There were no differences between language groups on the fourth administration of the CAP--Pattern III.

The cell means of low, average, and high language ability for the fourth administration of CAP-Pattern III were 4.00, 6.16, and 6.60, respectively. Significant simple effects for the differential influence of group membership on performance on the fourth administration of CAP-Pattern III were indicated in results summarized on Table 4-22, F (2,236) = 9.13, $p < 0.05$. Therefore, Hypothesis VI C-4 was rejected and it was concluded that group membership had an effect on student performance of CAP-Pattern III. Follow-up comparisons were necessary to pinpoint specific differences between language groups. Confidence intervals, following Bonferroni's procedure, were constructed and results are reported on Table 4-23. Results indicate similar performances by the average and the high group. In addition, both groups scored significantly higher than the low group. Zero was not

contained in either confidence interval for the contrasts, Group 1 versus Group 2 and Group 2 versus Group 3, so both hypotheses were rejected. Therefore, group membership for the fourth administration of the CAP-Pattern III differentially favored the average and high groups over the low group, and performance of the latter two groups was similar.

Hypothesis IV D: There were no trends in performance on CAP-Pattern III throughout kindergarten and first grade.

For CAP-Pattern III the cell and marginal means for the three language groups were previously reported on Table 4-20. Figure 4-D visually depicts the relationship between group performance and level of print awareness over time. Results from trend analyses, presented on Table 4-21, indicated a significant linear trend, F (1,59) = 490.38, p = 0.00. The analyses also revealed a significant interaction (Group x CAP Difference in Linear Trend), F (2,59) = 8.91, p = 0.00, indicating that the linear trend was not the same for all groups. The result for the quadratic trend was not significant, F (1,59) = 0.15, p = 0.70, but the interaction (Group x CAP Difference in Quadratic Trend) was F (2,59) = 5.54, p = 0.00. And finally, the results revealed a significant cubic trend, F (1,59) = 11.89, p = 0.00. Therefore, Hypothesis VI D was rejected. It was concluded that linear and cubic trends were present in the performance data for CAP-Pattern III, and, additionally, because of the interaction between group membership and time of test, linear and quadratic trends were not the same for all language groups.

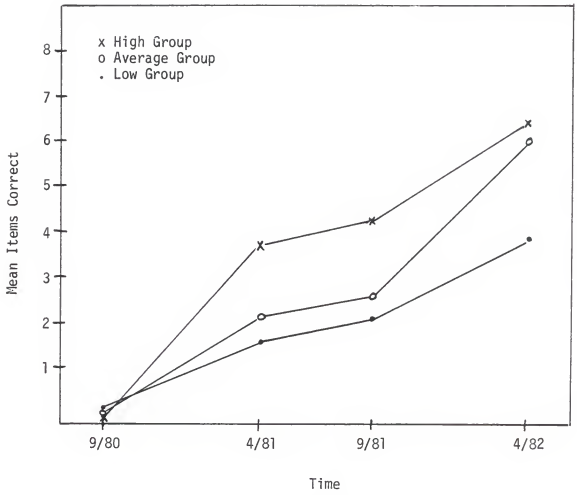

Figure 4-D. Plot of cell means summarizing the relationship between language ability and performance on four administrations of CAP--Pattern III.

Pattern IV

Hypothesis VII A: There were no differences in developmental levels of print awareness, measured by the CAP-Pattern IV, for students of different language abilities.

Table 4-24 presents cell and marginal means for the three language groups across the four administrations of the CAP-Pattern IV. Results of the split-plot analysis of variance for CAP-Pattern IV are summarized on Table 4-25. The main effect for group membership was not significant, F (2,59) = 1.26, p = 0.29. Therefore, Hypothesis VII A was not rejected, and it was concluded that all language groups performed equally well on CAP-Pattern IV.

Hypothesis VII B: There were no differences in levels of print awareness, measured by the CAP-Pattern IV, throughout kindergarten and first grade.

The marginal means for CAP-Pattern IV scores across the four administrations are presented on Table 4-24. The results of the split-plot ANOVA presented earlier on Table 4-25 indicated that the main effect for time of test was statistically significant, F (3,177) = 81.93, p = 0.00. So, Hypothesis VII B was rejected and it was concluded that performances were not the same throughout kindergarten and first grade. Follow-up comparisons, using the Bonferroni procedures, were carried out to locate specific differences in performance over time. Results of the comparisons of marginal means, presented on Table 4-26, indicated significant differences between the first administration and each subsequent administration. However, student performances on the second, third, and fourth administration to CAP-Pattern IV were similar.

Results indicate that CAP-Pattern IV had been mastered by the second administration of the test at the end of kindergarten.

Table 4-24

Cell and Marginal Means for Four Administrations of CAP-Pattern IV, Book-Orientation Concepts, by Three Language Groups

Administration Time	Groups			Marginal Means
	Low	Average	High	
1	1.40	1.69	1.80	1.65
2	2.67	2.81	2.93	2.81
3	2.87	2.88	3.00	2.90
4	3.00	3.00	3.00	3.00
Marginal Means	2.48	2.59	2.68	2.60

Table 4-25

Analysis of Variance of Differences Between Languages Groups Across Four Administrations of CAP-Pattern IV

Source	SS	df	MS	F
Between Subjects				
Groups	1.21	2	0.60	1.26
Subjects Within Groups	28.34	59	0.48	
Within Subjects				
CAP	67.92	3	22.64	81.93*
Linear Trend	50.10	1	50.10	104.22*
Quadratic Trend	16.21	1	16.21	80.59*
Cubic Trend	1.61	1	1.61	10.95*
Group X CAP	0.83	6	0.14	0.50
CAP X Subjects Within Groups	48.91	177	0.28	
Linear (Error)	28.36	59	0.48	
Quadratic (Error)	11.87	59	0.20	
Cubic (Error)	8.68	59	0.15	

*p=0.00

Table 4-26

Comparisons of CAP-Pattern IV Scores for
Four Administrations Using the Bonferroni Procedure

Comparison	Confidence Interval	Decision
Time 1 vs Time 2	(-1.41, -0.91)	Reject $H_{o_{1<2}}$
Time 1 vs Time 3	(-1.50, -1.00)	Reject $H_{o_{1<3}}$
Time 2 vs Time 3	(-1.60, -1.10)	Reject $H_{o_{1<4}}$
Time 2 vs Time 4	(-0.44, 0.06)	Do not reject $H_{o_{2=4}}$
Time 3 vs Time 4	(-0.35, 0.15)	Do not reject $H_{o_{3=4}}$

Hypothesis VII C: There was no interaction between time of test and group membership on CAP-Pattern IV scores.

Table 4-24, presented previously, presented the cell and marginal means for each administration of CAP-Pattern IV by group membership. Figure 4-E plots the cell means and graphically depicts the relationship between time of test and group performance. The test for the interaction (Group x CAP), presented on Table 4-25, was not significant, F (6,177) = 0.50, p = 0.2923. This finding resulted in the failure to reject Hypothesis VII C and the conclusion that the developmental trend on CAP-Pattern IV was consistent for students, regardless of language ability.

Hypothesis VII D: There were no trends in performance on CAP-Pattern IV throughout kindergarten and first grade.

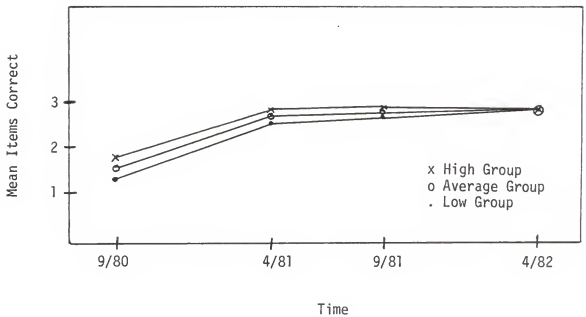

Figure 4-E. Plot of cell means summarizing the relationship between language ability and performance on four administrations of CAR-Pattern IV.

Results from the trend analyses were presented on Table 4-25. The calculated test statistic for linearity was significant for CAP-Pattern IV, F (1,59) = 104.22, p = 0.00. The results also indicated the presence of a statistically significant quadratic component in the data, F (1,59) = 80.59, p = 0.00. In addition, the test statistic for the cubic trend was significant, F (1,59) = 10.95, p = 0.00. Therefore Hypothesis VII D was rejected, and it was concluded that linear, quadratic and cubic trends were present in the CAP-Pattern IV scores during kindergarten and first grade.

Table 4-27 summarizes the findings from the split-plot with repeated measures design utilized for the analyses of the Concepts About Print Test data. The results from the analyses indicated that both main effects, as well as an interaction for one of the patterns, were statistically significant. The test for the main effect for language ability was significant for the total score, and for CAP--Patterns I and II. Follow-up comparisons showed a significant difference between the high and low group in each instance, and between the low and average group for CAP-Pattern II. The test for the main effect for time of test was significant for the total score and for CAP-Patterns I, II, and IV. Follow-up comparisons for time of test differences revealed a significant increase in performance between the first and each subsequent administration of the test for the total score and all patterns. The difference between the second and fourth administration was significant for the total scores and for CAP-Patterns I and II. A significant difference was found between the third and fourth administrations for the total score only. None of

the comparisons between the second and third were significant. Because the test for the interaction between language ability and the time of test was significant for CAP-Pattern III, follow-up analyses to identify significant simple effects were calculated. Significant differences between the low and the high and, also, between the average and high language groups were found for the second administration. The same results were revealed for the third administration. For the fourth administration, differences between the low and the average, and between the low and the high were significant. Trend analyses revealed significant linear, quadratic, and cubic components in the data for the total score and all CAP-Patterns, except for CAP--Pattern III which had linear and cubic trends.

Table 4-27

Summary of Significant Main Effects, Interactions, and Trends from Analyses of CAP Data

Significant Test Statistic	Concepts About Print Test Data				
	Total Score	Pattern I	Pattern II	Pattern III	Pattern IV
Language Ability	✓	✓	✓		
Time of Test	✓	✓	✓		✓
Interaction (Group x CAP)				✓	
Trends - Linear	✓	✓	✓	✓	✓
Quadratic	✓	✓	✓		✓
Cubic	✓	✓	✓	✓	✓

Construct Validity of TERA

Hypothesis VIII: There was no relationship between reading achievement, measured by the MAT, early reading ability, measured by TERA, knowledge of concepts about print, measured by CAP scores, and basal reading level, determined by Ginn placement, for first grade subjects.

To test this hypothesis, Pearson product-moment correlations were computed for MAT, TERA, CAP, and Ginn level. Results from the analyses are presented on Table 4-28. Zero order correlation coefficients showed that high positive relationships existed between the MAT and TERA (0.85), MAT and Ginn (0.84), and between TERA and Ginn level (0.85). Coefficients for these three measures and CAP were moderately strong and positive (CAP and TERA, 0.78; CAP and Ginn, 0.73; CAP and MAT, 0.68). Since the probability for each coefficient was less than the 0.05 level of significance, the null hypothesis was rejected. It was concluded that the TERA provided a valid measure of reading achievement at the end of first grade.

Table 4-28

Zero Order Correlation Matrix

	MAT	TERA	GINN	CAP
MAT	1.00	0.852*	0.836*	0.683*
TERA		1.00	0.847*	0.779*
GINN			1.00	0.734*
CAP				1.00

*p=0.0001

Findings Related to the Factor and Item Analyses

The split-plot with repeated measures analyses of variance yielded information to suggest that mastery of the four CAP patterns was not accomplished with equal ease by the three language groups. Pairwise comparisons of the mean performance scores revealed that the group's rate of progress in acquiring the skill sequences varied significantly. To study the internal structure and difficulty level of the patterns in

the CAP, factor and item analyses were utilized. The intent in these "data snooping" analyses was to clarify the developmental sequence in the acquisition schedule of the four patterns.

Factor analyses were performed on all the CAP responses of the 62 subjects in this study. For each administration of the CAP, the items were treated as variables and factor analyzed using the principal factors method. This method extracts a maximum amount of variance as each initial factor is calculated. The final solutions were obtained by rotating the initial factors following an orthogonal or varimax rotational method. Orthogonal rotations maintain independence between the factors by swinging both reference axes simultaneously, keeping them always at right angles to each other.

The analyses for the four administrations of the CAP produced six, five, eight, and five factors, respectively. Factor matrices for the analyses are presented on Tables 4-29 through 4-32. On these tables the factors are identified by a number and a letter. The number refers to a particular CAP administration. The letter indicates the ordinal position of that factor in explaining the amount of variance it accounted for in a particular analysis. Factors with eigenvalues less than one were not considered. The items, shown on Table 4-33, were clustered to fit the four factor patterns identified by Day and Day (1980a). Factor loadings equal to or greater than 0.40 have been underlined on each table to depict pattern tendencies and emphasize consistencies. Since factor loadings express correlations between the items and factor, those items with zero variance have no coefficients shown in the factor matrices.

Table 4-29

Varimax Rotated Factor Matrix for Concepts About Print Test on the First Administration

Item		CAP 1					
		1A	1B	1C	1D	1E	1F
Pattern I	3	.84	.16		.15		.06
	4	.81	-.17	-.11	.10	.08	.30
	5	.81	.14	-.14	.20	-.08	.33
	6	.64	-.12	-.19	.47	.16	.15
	7	.61	.22	-.18	.30	-.02	.18
	9	.26	.53	-.13	.03	.30	.31
	16	.23	-.25	-.25	-.51	.08	-.25
Pattern II	22	.30	-.11	-.02	.72	.15	.16
	23	.17	.23	.20	.73	.21	.13
	24	.38	.25	.17	.46	.35	-.07
	19	.20	.23	.43	.27	.09	.54
	21	.24	.04	-.09	.32	-.22	.66
	8	.04	.15	-.03	.68	.22	.19
Pattern III	10	.17	.75	-.36	.09	.36	.15
	12						
	13						
	14						
	20	.02	.90	.20	.06	.18	.06
	15	.06	.10	-.28	.09	.84	
	17						
	18						
Pattern IV	1	.30	.16	.63	.27	.27	.06
	2	.65	.29	.44	.01	.09	-.08
	11	.27	.14	.13	-.01	-.16	.77
Variance		3.91	2.20	1.31	2.66	1.42	1.86

Table 4-30

Varimax Rotated Factor Matrix for the
Concepts About Print Test on the Second Administration

Item		CAP				
		2A	2B	2C	2D	2E
Pattern I	3	.86	.08	.16	.30	.03
	4	.80	.12	.11	-.08	.35
	5	.69	.11	.38	-.14	.15
	6	.28	.43	.50	.12	.15
	7	.41	.22	.26	.09	.55
	9	.24	.17	.74	.11	.29
	16	.05	.11	.84	.03	-.10
Pattern II	22	.03	.10	.51	-.12	.49
	23	.48	.06	.25	.03	.71
	24	.52	.17	.12	.09	.68
	19	.29	.04	.58	.04	.41
	21	-.13	.07	.31	.17	.85
	8	.35	.19	.17	.58	-.13
Pattern III	10	.01	.53	.29	.39	.15
	12	.07	.76	.20	-.14	-.03
	13		.79	.07	.11	.09
	14	.01	.70		.13	.13
	20	.06	.75	.12	.09	.10
	15	.28	.36	.57	-.25	.12
	17	.16	.54	.23	-.51	.03
	18	.19	.61	.12	-.28	.03
Pattern IV	1					
	2	.82	.02	.15	.05	.04
	11	.27	.15	.69	.23	.18
Variance		3.80	3.74	3.61	1.22	2.81

Table 4-31

Varimax Rotated Factor Matrix for the
Concepts About Print Test on the Third Administration

Item		CAP 3							
		3A	3B	3C	3D	3E	3F	3G	3H
Pattern	3			-.06	.64		.01	.44	
I	4	.04	.98	-.03	.05	.03	.02	.01	.02
	5	.11	.66	.09	.50	-.02	-.05	.27	-.09
	6	.14	.19	.13	.46	.23	.12	.16	.61
	7	.04	.98	.03	-.05	.04	.02	-.01	.02
	9	-.02	.29	.33	-.13	.69	.15	.03	.14
	16	.06	-.08	-.23	-.04	.64	-.21	.07	.26
Pattern	22	.14	-.12	.13	.10	.36	.16	.02	.65
II	23	.07	-.06	.26	.08	.13	-.19	.14	.76
	24	.08	-.07	-.17	.13	.36	.57	.42	.25
	19	.07	.03	.78	.31	.01	-.13	.14	
	21	.08	-.04	.02	-.11	-.07	.87	.13	
Pattern	10	.32	.12	.06	.30	.29	.08	.14	.40
III	12	.47	.15	.11	.30	.10	.32	.15	.54
	13	.72	.07		.11	-.11	.06	.05	.45
	14	.83	.05	.09	.04	.18	.09	-.20	.02
	20	.59	.10	.18	.22	.45	.31	.02	.12
	15	.18	-.09	.18	.50	.62	.07	.22	.25
	17		.06	.13	-.03	.02	-.05	.84	.02
	18	.67	-.03	-.03		-.02	-.11	.25	.13
Pattern	1								
IV	2	.01	-.04	.75	-.06	.19	.30	.06	.16
	11	.10	.01	.04	.91	-.04	-.08	.04	.03
Variance		2.45	2.59	2.19	2.37	1.99	1.61	1.44	2.38

Table 4-32

Varimax Rotated Factor Matrix for the
Concepts About Print Test on the Fourth Administration

		CAP 4				
Item		4A	4B	4C	4D	4E
Pattern I	3					
	4					
	5					
	6					
	7					
	9					
	16	.16	.18	.16		.76
Pattern II	22	.71	-.14	-.14	-.21	-.29
	23	.15	.22	.83	.02	.16
	24	.07	.03	.82		.31
	19					
	21					
	8	.16	-.32	.12	.78	.14
Pattern III	10	.60	.04	.31	.47	.17
	12	.74	-.13	.32	.18	.10
	13	.76	.14	.02	.25	.30
	14	.69	.27	.04	.13	.35
	20	.12	.13	-.15	.86	.04
	15	.10		-.04	.14	.73
	17	.25	.70		.28	-.01
	18	.21	.81	-.07	.04	-.03
Pattern IV	1					
	2					
	11					
Variance		2.67	1.49	1.65	1.84	1.60

Table 4-33

Item Structure of CAP Patterns Identified by Day and Day

Pattern 1 - Print-direction Concepts	
3. Start at top left	7. First and last
4. Move left to right	9. Movement along inverted print
5. Line to line return sweep	16. Punctuation (.)
6. Word by word pointing	
Pattern 2 - Letter-word Concepts	
22. One word, two words	19. Capital/lower case letters
23. First and last letter	21. One letter, two letters
24. Capital letter	8. Bottom of inverted picture
Pattern 3 - Advanced-print Concepts	
10. Inverted line sequence	20. Reversible words (was, no)
12. Word sequence incorrect	15. Punctuation (?)
13. Letter order incorrect	17. Punctuation (,)
14. Letter order incorrect	18[2] Punctuation (")
Pattern 4 - Book-orientation Concepts	
1.[1] Orientation of book	11. Left page before right page
2. Print carries message	

[1] Items 1 and 18 were placed intuitively.

The data indicated that Pattern III, Advanced-print concepts, was appropriately named. For the first administration, only one subject in each group gave a correct response to any of the items in this pattern. This meant that five of the eight items were too difficult for even one correct answer. For this reason there were no item variances and, therefore, no factor loadings for those items. However, low loadings for the three items getting a correct response were similar. On the second administration, high loadings on the same factor for seven of the eight items support the stability of the pattern. By considering a factor loading less than 0.40, which Day and Day (1980a) acknowledge they did in some instances, the remaining item can also be included in this factor pattern.

Items nine and sixteen appear to be misplaced for the first administration. Item nine seems to belong in Pattern III, Advanced-print concepts, and item sixteen in Pattern II, Letter-word concepts. But, in later administrations, factor loadings tend to increase and cluster together for these items.

The second and third administrations produced more scattered factor loadings for Patterns I, II, and IV. Item nine, for example, was not consistent for any two analyses. Some inconsistencies are to be expected, though, since dichotomous variables and relatively small samples tend to produce unstable factor patterns (Comrey, 1978). The Day and Day (1980a) sample was smaller than the present one. (Their sample of 56 for the first three administrations, in kindergarten, dropped to 51 by the fourth administration in first grade.) For these reasons, Day and Day interpreted factors with eigenvalues less than

one, and considered factor loadings less than 0.40 to verify consistencies and trends across the analyses in establishing their factor patterns. Given these differences, results from the present analyses are remarkably similar to the earlier study. These data tend to support the CAP pattern structure and factor groupings identified by Day and Day (1980a). Table 4-34 shows items from the present study as they related to the patterns previously identified. Even on the fourth administration, Pattern III remains fairly stable.

Based on the results of their factor and item analyses, Day and Day (1980a) drew the following conclusion:

> . . . that "Book-orientation concepts" would be the first set of print-related concepts understood by the child. This knowledge should be followed by "Print-direction concepts" and "Letter-word concepts." Finally, "Advanced-print concepts" of word identification and punctuation would be acquired as the child continues to develop "print sense." (pp. 7-8)

Results of an item analysis of the correct responses for each factor pattern from the participants in this study supported their conclusion. At the beginning of kindergarten 82.3% of the subjects could identify the front of a book, about 50% knew that print--not pictures--is "read," and about 35% knew that a left page is read before a right page. Only one item in Print-direction concepts received a correct response from as many as half of the subjects. Fewer than a fourth of the group responded correctly to the other five items in this pattern. The data showed that subjects had little knowledge of Advanced-print concepts at the beginning of kindergarten.

Each subsequent administration of the CAP showed a gradual increase in the percentage of correct responses to items in the four

Table 4-34

Item Structure of CAP Patterns from Current Study

	Pattern 1	Pattern 2	Pattern 3	Pattern 4
CAP 1 Kgd Sept/ Oct.	3 4 5 6 7	22 19 23 21 24 11* 8 16*	10 12 20 13 15 14 17 9* 18	1 2
CAP 2 April Kgd	7 23 24 21	6 8 9 11 16 22	10 12 20 13 15 14 17	1 2 3 4
	1 item constant (11)			
CAP 3 Sept. 1st.	9 16 24 8	19 21 2 22 23	10 12 20 12 15 14 17 18	1 3 4 5 6
	1 item constant (11)			11
CAP 4 April 1st.	23 24	20 8	10 12 13 15 14 16 17 22 18	
	11 items constant (1, 2, 11, 3, 4, 5, 6, 7, 9, 19, 21) 3 items = 61 correct responses (16, 22, 23)			

*Day and Day included items 9 and 16 in Pattern 1 and item 11 in Pattern 4.

Table 4-35

Frequency of Correct Responses
for Items on Four Administrations of CAP

		CAP 1		CAP 2		CAP 3		CAP 4	
Item		Number Subjects	%	Number Subjects	%	Number Subjects	%	Number Subjects	%
Pattern 1	3	21	33.9	58	93.5	61	98.4	62	100.0
	4	12	19.4	57	91.9	61	98.4	62	100.0
	5	15	24.2	56	90.3	59	95.2	62	100.0
	6	7	11.3	44	71.0	42	67.7	62	100.0
	7	13	20.0	52	83.9	61	98.4	62	100.0
	9	6	9.7	49	79.0	51	82.3	62	100.0
	16	4	6.5	52	83.9	60	96.7	61	98.4
Pattern 2	22	12	19.4	53	85.5	50	80.6	61	98.4
	23	15	24.2	54	87.1	51	82.3	61	98.4
	24	16	25.8	52	83.9	52	83.9	58	93.5
	19	22	35.4	57	91.9	61	98.4	62	100.0
	21	35	56.5	59	95.2	60	96.7	62	100.0
	8	24	38.7	54	87.1	53	85.5	57	91.9
Pattern 3	10	2	3.2	19	30.6	25	40.3	49	79.0
	12	0		16	25.8	32	51.6	53	85.5
	13	0		11	17.7	18	29.0	41	66.1
	14	0		9	14.5	14	22.6	40	64.5
	20	1	1.6	17	27.4	27	43.5	59	95.2
	15	2	3.2	43	69.4	45	72.6	58	93.5
	17	0		24	38.7	19	30.6	36	58.1
	18	0		19	30.6	6	9.7	15	24.2
Pattern 4	1	51	82.3	62	100.0	62	100.0	62	100.0
	2	31	50.0	60	96.7	60	96.7	62	100.0
	11	20	32.2	52	83.9	58	93.5	62	100.0

patterns. By the end of kindergarten, the second administration, Book-orientation concepts has been mastered, and about three-fourths of the subjects knew most of the items in Print-direction and Letter-word concepts. All items in the Advanced-print pattern received some correct responses. However, only one item received correct responses from as many as half the subjects. The majority of subjects did not respond correctly to the other seven items. The third administration showed an increase in correct responses for most items. And by the last administration, at the end of first grade, Print-direction and Letter-word concepts had been mastered by at least 90% of the subjects in the sample. Correct responses for Advanced-print concepts ranged from 24% to 95% for particular items. Table 4-35 shows a frequency distribution of correct responses by item for all administrations of the CAP.

The item analyses indicated that Book-orientation concepts had been acquired by some of the participants at the beginning of kindergarten, and by the others before the end of kindergarten; that Advanced-print concepts had not been mastered by many subjects at the end of first grade; and that Print-direction and Letter-word concepts evolved through a slow intermediate acquisition schedule stretching over the major part of the two-year period. Therefore, findings from these factor and item analyses support the view that knowledge of concepts about print involves sequences or patterns of skills that continue to develop long after the initiation of formal reading instruction has begun.

Discussion of Results

Statistically significant relationships between ten independent variables and student achievement, at the end of kindergarten and first grade, were substantiated in linear regression analyses. Pearson product-moment correlation coefficients showed the nine of the ten independent variables were related to reading readiness levels, but only seven were significantly related to reading achievement. Results from multiple regression analyses furnished evidence to support this finding. In both instances, the overall regression model confirmed the existence of a significant relationship between the entire set of independent variables and the dependent variables, even though some of the variables were not individually effective in explaining the variation in achievement levels.

Stepwise regression analyses were performed on the data to identify a subset of the independent variables that would explain the greatest proportion of the variation in the dependent variables. The variables eliminated from the model with this procedure did not add significantly to the explanation of the variation in reading readiness or reading achievement scores. Such variables could be dropped from the model with no loss of predictive information, because they were not sources of unique variation in achievement. In general, variables that are more highly correlated with each other than they are with the dependent variable of interest tend to provide redundant information. For example, the zero order correlation coefficient for the CAP and MRT was 0.48, but zero order correlation coefficient for CAP and seven of the remaining nine independent variables were all greater than 0.48.

Similarly, correlation coefficients for the MRT and several of these variables were slightly more or less than 0.48. From these comparisons of correlation coefficients, it would appear that CAP did not make a unique contribution to the explanation of the variation in reading readiness levels, and may, therefore, have been providing redundant information. The fact that it was dropped from the reduced model would support this observation.

The best subset of predictor variables for reading readiness achievement included only two variables, Size-Quantity concepts, and Naming Numbers. One of the two was also included in the subset of predictor variables for reading achievement at the end of the first grade. In addition to Size-Quantity concepts, Naming Lower Case Letters, the Florida Language Screening System, Phonemic Segmentation, and Rote Counting were also included. These data suggest that two of the eight basic screening tests can predict reading readiness about as accurately as the total battery. Likewise, at the first grade level, only five of the eight supply relevant information. It would appear that PREP screening could be simplified, and accomplished more efficiently, by reducing the number of tests administered. Some of the tests currently being used may be supplying redundant information. The possibility exists that fewer tests could provide adequate data for educational decision making. Another equally important consideration is the fact that the screening variables, investigated in this study, accounted for about half the variation in reading readiness and reading achievement scores. Revision of current screening procedures could provide for the inclusion of other variables that might help to explain that remaining "unexplained" variation in early reading achievement.

The surprising outcome from this portion of the study was the fact that the CAP was not identified as a significant predictor of reading readiness or reading achievement. It was significant for both achievement measures in the overall regression models, but it evidently supplied redundant information because it was dropped in both reduced models. Even though the zero order correlation coefficient for CAP and the MAT was considerably higher than it was for CAP and the MRT, the amount of variation explained by its addition to the stepwise regression was minimal. While this finding had not been expected, it could have been anticipated, logically speaking, since neither achievement measure sampled knowledge of printing conventions directly.

Results from the split-plot analysis of CAP scores appeared to support the existence of developmental patterns within the CAP. The data also suggested that the patterns were characterized by varying levels of difficulty, since they were acquired in a specific order. Results from factor and item analyses supported these findings. The factor analyses provided verification for the pattern structures identified in earlier research by Day and Day (1980a). Item analyses, by pattern groupings, supported the existence of developmental patterns or skill sequences that were mastered in a hierarchical ordering of difficulty. Pattern IV, Book-orientation concepts, was easiest. This pattern was acquired prior to entry into kindergarten for some children, and during kindergarten for the remainder. On this pattern, the three language groups performed equally well from the first administration. Pattern I, Print-direction concepts, was acquired next.

The majority of the participants in this study mastered Pattern I by the end of kindergarten. However, two of the items in that pattern continued to be troublesome for students well into the first-grade year. By the end of first grade, Pattern II, Letter-word concepts had been mastered. The most difficult pattern still presented problems for the participants on the last administration, at the end of first-grade. Throughout the two year period, the participants' performance on Pattern III, Advanced-print concepts, showed slow, but steady, increases. Even so, at least half the items had not been learned by a large number of the subjects at the end of this study.

On the one hand, participants in this study seemed to master the developmental patterns according to the acquisition schedule reported by Day and Day (1980a). Yet, on the other hand, subjects in the current study apparently learned the skill sequences more rapidly than those in the previous study. Day and Day reported that subjects in their study responded correctly to fewer than half the CAP items on the fourth administration of the test. Their fourth administration of the test occurred at the beginning of first grade. This would indicate that their subjects skill or pattern acquisition rate was considerably slower than that of the participants in the present study. This group of subjects responded correctly to two-thirds of the items at the end of kindergarten, on the second administration, and to slightly more than two-thirds at the beginning of first grade, on the third administration.

The two groups' particular level of print awareness, or rate of skill acquisition reflected by the mastery of the development patterns,

may have resulted from curriculum differences in the two school systems. No descriptive information that might explain this difference in the performance of the two groups of subjects was available in the Day and Day report. However, performance of the participants in this study may have had an advantage due to the new Primary Education Program requirements. New program guidelines requiring individualized instructional strategy assignments, based on screening and assessment results and/or reduced pupil teacher ratios may account for a portion of the difference. The subjects in this study were in classrooms with a teacher and a full-time instructional aide. The number of students per classroom ranged from 23 to 29. The aides worked with small groups in language, listening, and "lap-reading" activities. Many of the activities involved "print" and students were encouraged to talk about the print. They "interacted" with concrete examples of letters, words, numbers, and sentences. They were encouraged to show the teacher/aide where to read. They also were allowed to turn the pages and point to the next word. Perhaps, teacher observation of student responses and immediate feedback, during these instructional sequences, prevented the habituation of incorrect early reading behaviors. These activities and two adults per classroom may have given the participants in this study an instructional advantage over those in the earlier one.

The CAP scores from the four administrations were subjected to trend analyses to determine the relationship between the four patterns and the total scores for the language groups. As might be expected, the performance curves were characterized by similar linear growth patterns between the first and second administrations for the total

score and the four patterns. Similar trends were apparent for the interval between the third and fourth administrations for the total score and all of the patterns except Pattern IV. This is the pattern that most students had mastered by the end of kindergarten. Performance curves for the interval between the second and third administrations were flat, almost completely horizontal. The shape of these curves suggested that little growth took place during that interval. This was not surprising. Several factors could have influenced the absence of growth during this period. First, the interval itself was shorter, encompassing four months as opposed to six months for the intervals before and after it. Secondly, for the greater portion of this time, schools were closed for summer vacation. During vacation no instruction was taking place. Or at least, the planned on-going instructional activities involving "print" had decreased by several hours a day. It would appear that when classroom instruction was going on, during the longer intervals, that learning increased. However, during summer vacation very little or no growth occurred. This indicates that concepts about print are particularly sensitive to instruction. While mastery of the patterns in the CAP follow a specified sequence, developmental level of print awareness does not appear to be a natural consequence of age.

The partitioning of the variation in performance into nonoverlapping trend components revealed that a majority of the variation was due to differences in the linear trend for Patterns I, II, and IV and also for the total score. For example, the sum of squares linear for total scores was equal to 7047.60. Thus, the sums of squares for the linear trend accounted for most of the variation in performance (7047.60

divided by 8274.88 = 85.2 percent). Similar calculations for the other trend components showed that differences in the quadratic trend accounted for 11.4 percent of the variation and the cubic trend accounted for only 3.4 percent. The percentages were similar for all patterns, except for Pattern III, the one with the interaction. For that pattern, the sums of squares for interaction were partitioned into linear quadratic, and cubic components to reveal that 55.5 percent, 41.5 percent, and 9 percent of the variation in performance could be traced to each component respectively. This was not unexpected, at this point, because participants did not know the Advanced-print Concepts when they entered kindergarten. Not only did they enter school not knowing items in this pattern, two years later they still had not mastered this particular set of items. In spite of the constant, and slow but significant improvement, performance trends for the three language groups continued to be different each time the CAP was administered.

Results from the split-plot analyses, the item and factor analyses, and the trend analyses support the finding of previous research (Clay, 1979; Dewitz and Stammer, 1980; Harlin, 1981; Mason, 1980) that print awareness is developmental in nature. It further verifies the existence of a hierarchy of skill sequences, patterns, or stages, that develop in a linear fashion as students of different language abilities "interact with print" (Clay, 1979). These findings provide additional evidence to verify an earlier conclusion that beginning readers possess varying levels of print awareness (Blackowicz, 1978; Harlin, 1981; Kovalcik, 1979; Teale, 1978).

The present findings also indicated that planned instruction may be necessary for optimal development of visual and linguistic concepts about print. It should be remembered that the maximum growth periods occurred during the "instructional intervals" and leveled off during summer vacation. This finding, together with the apparent faster development of the present group of subjects, suggests that development of linguistic awareness in young children is facilitated by exposure to direct teaching. And finally, results from the present study verify the conclusion of earlier research (Harlin, 1981; Ryan, McNamera, and Kenney, 1977) that knowledge of visual and linguistic concepts about print continue to develop long after the beginning stages of reading instruction have been initiated.

Correlation coefficients computed for three measures of reading achievement and the TERA verified its construct validity. Relationships between the TERA, the MAT and Ginn Level were exceptionally strong and positive. And, although, the relationship between the TERA and the CAP was not as strong, it was still quite high. A high correlation between these two instruments was anticipated. In fact, since both tests measure knowledge of concepts about print, a higher relationship may have been expected for these measures than for the other reading achievement measures included in the analyses. It should be noted, however, that although the TERA and the CAP measure knowledge of printing conventions, the TERA does more. TERA also measures the child's ability to learn the alphabet and its uses. Perhaps this explains why its relationship with the MAT and with Ginn Level were stronger than its relationship with the CAP. After all,

alphabetic knowledge, Naming Letters, was identified as a significant predictor of reading achievement in the stepwise regression analyses discussed earlier in this study.

The TERA was published in 1981, after the MRT had been administered to the participants in present study. For this reason, it was not possible to obtain a correlation coefficient for these two measures. However, there are data to suggest that the TERA might be more highly correlated with the MRT, than the other measure of print awareness in this study. A stronger link was revealed between the TERA and the other reading achievement measures, than between the CAP and those measures. In addition, the relationship between the CAP and the TERA was stronger than that between the CAP and the other achievement measures. This would imply that the TERA might be a more significant predictor of reading readiness, as measured by the MRT, than the CAP. If this were true, then the TERA, with its expanded alphabetic content, might be a better indicator of print awareness, particularly at the kindergarten level.

The logical implication to be drawn from this discussion is that TERA appears to be a promising alternative to the CAP as a measure of print awareness. Future research should address this issue. Caution should be exercised, however, because it cannot be assumed that the TERA and the CAP provide the same information. In fact, such an assumption would be erroneous. As previously stated, the TERA samples knowledge of the alphabet and its uses, in addition to print awareness. The CAP, likewise, samples knowledge of Advanced-print concepts and Letter-word concepts, that are not included in TERA's content. However, the split-plot repeated measures analyses and the factor and item

analyses showed that these two skill sequences were too hard for beginning kindergarteners. This means that Book-orientation concepts and Print-direction concepts, skills that kindergarten students did learn successfully, were included in the content of the TERA. For these reasons, it is possible that the TERA might be a more appropriate instrument for measuring level of print awareness at the beginning of kindergarten. The fact that the TERA also samples alphabet knowledge might mean that it could provide the same information that was previously obtained from several of the eight instruments in the PREP Screening Test Battery.

CHAPTER V
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study investigated the significance of concepts about print and the PREP screening variables for predicting early reading achievement. The study also monitored the longitudinal development of print awareness over a two-year period. The intent was to determine the developmental nature of knowledge of concepts about print throughout kindergarten and first grade. Finally, it investigated the construct validity of a new instrument for assessing early reading behaviors. This test, TERA, was unique because it sampled both knowledge of the printing conventions that govern the English language and the more traditional reading tasks such as picture-letter-word recognition, listening comprehension, and reading comprehension.

Participants in the study were 62 children who had attended the same Alachua County elementary school during kindergarten and first grade. They were all five years old on or before December 1, 1980. Their progress in reading was monitored from the beginning of kindergarten, August, 1980, until the end of first grade, April, 1982. The group was composed of 47 (75.8%) white subjects and 15 (24.2%) subjects from ethnic minorities.

During September and October of the kindergarten year, the participants were tested with the Alachua County PREP Screening Battery. In

April of the same school year, the Metropolitan Readiness Test and Concepts About Print Test were administered.

The following year, September, 1981, when the participants were in first grade, Concepts About Print Test was administered a third time. Finally, in April, 1982, Concepts About Print Test was administered a fourth time. During the same month, the Metropolitan Achievement Test and the Test of Early Reading Ability were also administered.

Pearson product-moment correlations showed that all of the ten independent variables were significantly related to reading readiness and seven were significantly related to later reading achievement. Linear regression analyses revealed that all of the independent variables were not equally effective for predicting reading readiness or reading achievement. Stepwise regression analyses were utilized to identify a best subset of predictors for both dependent variables. The best predictors of reading readiness were Size-Quantity concepts and Naming Numbers. The best subset of predictor variables for reading achievement contained five variables. In addition to Florida Language Screening System, Phonemic Segmentation, Naming Letters and Rote Counting, Size-Quantity concepts, one of the predictors of reading readiness, was identified again.

A 3 x 4 factorial analysis of variance with repeated measures on one factor was utilized to investigate the developmental nature of print awareness. A significant main effect for language ability was revealed for Concepts About Print total scores, for Concepts About Print--Pattern I scores, and for Concepts About Print--Pattern II scores.

The Bonferroni procedure was utilized to locate specific differences between the three language groups. Significant differences between the low and high language groups were found for the Concepts About Print total scores and for CAP--Patterns I and II. For CAP--Pattern II a significant difference between the low and average language group was also found.

A significant main effect for time of test was revealed for Concepts About Print total scores, and for CAP--Patterns I, II, and IV. All possible pairwise comparisons for the main effect for time of test were calculated. As might be expected, this procedure revealed significant mean performance differences between the first and each successive administration for the total scores and the four patterns. There was also a significant difference between the second and fourth administration for Pattern I. Finally, all pairwise comparisons for time of test for total scores were significant, except the one for the second and third administrations.

Finally, a significant interaction between group membership and time of test was found. Analyses of variances were computed for the four test administrations from Pattern III to test simple main effects of the interaction. There were significant differences between language groups on the second, third, and fourth administrations of the CAP. There was no difference between the groups on the first administration of the test.

The results from the split-plot analyses of variance with repeated measures and the follow-up analyses suggested a developmental sequence in level of print awareness for the participants in this study. Items

in CAP--Pattern IV, Book-orientation concepts, were easiest. They were learned first and rather quickly. Items in CAP--Pattern I, Print-direction concepts, and CAP--Pattern II, Letter-word concepts, were more difficult and required more instructional time for mastery. Items in CAP--Pattern III, Advanced-print concepts, were so difficult that they had not been mastered by the last administration of the test at the end of first grade.

At this point, factor and item analyses were performed on the CAP responses to further clarify the scope, sequence, and acquisition schedule of the skill patterns in the CAP. Results from these analyses supported the pattern structure and factor groupings identified in the earlier research of Day and Day (1980a). These findings were also consistent with the split-plot analyses. They verified that Pattern IV, Book-orientation concepts, had been acquired by some students at the beginning of kindergarten and mastered by virtually all of the students by the end of that year. On the other hand, Pattern III, Advanced-print Concepts, had not been mastered by the end of first grade. However, Pattern I, Print-direction Concepts, and Pattern II, Letter-word Concepts, were acquired through a slow intermediate schedule during kindergarten and first grade.

The data were also subjected to trend analyses. These analyses indicated the presence of significant linear, quadratic, and cubic trend components for CAP--Patterns I, II, IV and total scores. Significant linear and cubic trends were also found in the CAP--Pattern III scores.

Finally, Pearson product-moment correlations revealed strong positive correlation coefficients between the Metropolitan Achievement

Test, the Test of Early Reading Ability and Ginn reading levels. Moderately high positive correlations were substantiated between the Concepts About Print Test and the other three measures of reading achievement.

Conclusions

The following conclusions seem warranted based on results from this study's statistical analyses.

1. Screening procedures currently required by the Primary Education Program at the beginning of kindergarten may be excessive. Much of the information collected may be redundant. While all of the ten independent variables were significantly related to reading readiness achievement, all but two were dropped from a reduced model of predictor variables. The reduced model included Size-Quantity concepts and Naming Numbers.
2. Similar results were obtained at the first-grade level. Seven of the ten independent variables were significantly related to reading achievement. The reduced model of predictor variables included, Size-Quantity concepts, Naming Letters, Rote Counting, Phonemic Segmentation, and the Florida Language Screening System.
3. The pattern structure and item groupings identified by Day and Day (1980a) were supported in the results from the factor and item analyses. The existence of a developmental sequence in the acquisition of these four CAP patterns was supported by results from these analyses and the split-plot analyses.

These skill sequences were acquired in the following order. Pattern IV, Book-orientation concepts, was acquired prior to or during kindergarten. Pattern III, Advanced-print concepts, had not been mastered at the end of first grade for many subjects. Pattern I, Print-direction concepts, and Pattern II, Letter-word concepts, were mastered in a slow elaboration process somewhere in between. This information should be used by classroom teachers to gauge the scope and sequence of specific "print" related activities for children of different language abilities.

Pairwise comparisons, between the three language ability groups, showed the low and high groups were notably different on all scores except those for Pattern III. In addition, the average group also did significantly better than the low group on Pattern II. Analyses of variance for the Pattern III interaction showed that performances of the three groups were significantly different on each successive administration of the CAP after the first one. For that particular administration, only one subject in each group gave correct responses to one or two items in that pattern.

4. Findings from the trend analyses are indicative of the importance of instructional strategies for the acquisition of concepts about print. Linear, quadratic, and cubic trend components in the overall trend of the data were significant. However, it was shown that the linear component accounted for the vast majority of the variation in level of print awareness

except for Pattern III. An examination of the performance curves showed that the linear components were associated with the instructional periods within the school years. During summer vacation, when little, if any, instruction took place and the interval was shortened between test administrations, the curves flattened out. The shortened duration of this interval compared with the longer ones during the school year and diminished instruction may have influenced the significance level of the quadratic and cubic trend components. At any rate, the results suggest that level of print awareness is significantly increased during periods of instruction for children of all language abilities.

5. Evidence of the construct validity of the TERA was obtained from correlational analyses. High positive correlations were revealed between TERA, MAT, and Ginn Levels. A lower, but moderately high, relationship was shown for CAP and TERA. Perhaps this lower relationship between these two indicators of print awareness could have been anticipated. In the first place, TERA samples knowledge of the alphabet and its uses, as well as knowledge of the conventions of print. Secondly, because Naming Letters was a significant predictor of reading achievement, it follows that TERA, by including alphabetic content, would be more highly correlated with MAT than would CAP. And finally, an earlier analyses in this study showed that the MRT and the MAT were much more highly correlated than the CAP and the MRT. These results all support the construct validity of the TERA as a measure of reading achievement.

6. The findings, summarized above, further suggest that TERA may be a promising alternative to the CAP as an indicator of level of print awareness. Since it samples knowledge of printing conventions and traditional readiness tasks, "alphabetic knowledge," it may be a better predictor of reading readiness than the CAP for kindergarten students.

Recommendations

The following recommendations are suggested as a result of the findings and conclusions of this study. Implications for application to curriculum planning and delivery of instructional strategies for individual students are also discussed.

1. The PREP screening procedures in Alachua County, for kindergarten, should be reviewed for possible revision and simplification.
2. Since Size-Quantity concepts was a significant predictor of both reading readiness and subsequent reading achievement, it should be retained in the PREP screening battery for kindergarten.
3. Since Phonemic Segmentation and Naming Letters were predictors of reading achievement, they should be dropped from the readiness screening battery and considered as screening criteria for first grade. This would mean that Naming Numbers would be retained at the kindergarten level. An examination of the correlation coefficient for Naming Letters and Naming Numbers indicated that the two variables might be redundant sources of information. Such redundancy could indicate that these two tests sample dimensions of the same cognitive skills,

tasks, and/or mental processes. Both deal with symbolic representations. It would seem that if a child could manipulate one set of language symbols he could generalize that ability to other symbolic representations of oral language. Additional study is needed for clarification.

4. A study to verify current findings should be conducted using the predictor variables identified by both reduced models. Six instead of ten independent variables would be studied. They would include Size-Quantity concepts, Naming Letters, Naming Numbers, FLASC, Phonemic Sementation, and Rote Counting.
5. Based on the current findings, another study should be designed to investigate the relative importance of additional predictor variables to explain the variation in achievement that was not explained by the variables in the current PREP Screening Test Battery.
6. Additional study should be planned to investigate the potential significance of the TERA as an alternative to CAP for measuring print awareness at the kindergarten level. Its significance as a predictor of reading readiness also needs to be clarified.
7. The linear trends revealed during instructional periods need verification with more frequent data collections between the test administrations.
8. Current practices emphasizing instructional strategies and activities that require kindergarten and first-grade students to "interact" with print should be maintained and strengthened.

9. Further study should investigate the potential usefulness of the identified CAP patterns as subtests for classroom and clinical applications. It is evident that Pattern III items are too difficult for many six-year-old students. Hence, the administration of Pattern III items to five-year-old students at the beginning of kindergarten can logically be deemed inappropriate and a waste of time for teacher and student.

APPENDIX A

PARENT PERMISSION LETTER

April 16, 1982

Dear Parents,

I am a graduate student in instructional leadership and support at the University of Florida. I am working on my dissertation to complete the requirements for the doctoral degree. As a part of my study, I need to collect data on the reading performance of first grade students. I will need to administer two tests of early reading ability (the Concepts About Print Test and the Test of Early Reading Ability) to your child. Each test will require 10-15 minutes. In addition, I will need to use his/her Metropolitan Achievement Test score and the results from the PREP screening battery which was administered last year.

Results from these tests will not be used by the school to assess performance or determine placement. Your child's scores will only be used for purposes of the analysis of data for my study. Student scores will be kept confidential to the extent provided by law.

I would appreciate it if you would give permission for me to test your child.

Sincerely yours,

Jonnie P. Ellis

I give my permission for _____
(child's name)

to be tested on the CAP and the TERA.

_____
(signature of parent)

_____
(date)

APPENDIX B

RAW DATA

Student Number	Book	Orientation		Total	Print-direction Concepts							Total	Letter-word Concepts						Total	Advanced-print Concepts								Total	Grand Total
	1	2	11		3	4	5	6	7	9	16		8	19	21	22	23	24		10	12	13	14	15	17	18	20		
01	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	01
02	1	1	1	3	1	1	1	1	1	0	1	6	1	1	1	0	0	1	4	0	0	0	0	0	0	0	0	0	13
03	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	02
04	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	01
05	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	01
06	1	1	1	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	04
07	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	02
08	1	0	0	1	1	0	0	0	0	0	1	2	1	1	0	1	1	0	3	0	0	0	0	0	0	0	0	0	06
09	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	02
10	1	0	1	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	04
11	1	1	1	3	1	1	1	0	1	0	0	4	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	13
13	1	1	1	3	1	0	0	0	0	1	0	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	06
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00
15	1	1	0	2	1	0	1	0	1	0	0	3	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	07
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00
17	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	02
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00
19	1	1	0	2	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	05
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	01
21	1	0	1	2	1	1	1	0	0	0	0	3	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	06
22	1	1	0	2	1	1	1	1	1	0	0	5	0	1	1	1	1	0	4	0	0	0	0	0	0	0	0	0	11
23	1	1	1	3	1	1	1	0	0	0	0	3	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	08
24	1	1	1	3	0	0	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	05
25	1	1	1	3	0	0	0	0	0	0	0	0	1	1	1	0	0	0	3	0	0	0	0	0	0	0	0	0	06
26	1	1	0	2	1	1	1	0	0	0	1	4	1	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	08
27	1	1	0	2	1	0	0	0	0	0	0	1	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	05
28	1	1	1	3	1	0	1	0	1	1	0	4	1	1	1	0	1	1	5	1	0	0	0	0	0	0	1	2	14
29	1	1	0	2	0	0	0	0	0	0	0	0	0	1	1	1	1	0	5	0	0	0	0	0	0	0	0	0	07
30	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	01
31	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	01
32	1	0	1	2	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	04
33	1	0	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	03
34	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	04
35	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	03
36	1	1	0	2	1	0	0	0	1	0	0	2	1	1	1	0	1	0	4	0	0	0	0	0	0	0	0	0	08
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	01
40	1	0	1	2	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	04
41	1	1	0	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	04
42	1	0	1	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	04
43	1	0	1	2	1	1	1	0	1	0	0	4	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	08
44	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	5	0	0	0	0	0	0	0	0	0	06
45	1	1	0	2	1	1	1	1	1	0	0	6	1	0	1	1	1	1	5	0	0	0	0	0	0	0	0	0	13
46	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	02
47	1	1	13	1	1	1	1	1	1	1	0	6	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	15
48	1	1	0	2	0	0	1	0	0	0	0	1	0	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	07
49	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	4	0	0	0	0	0	0	0	0	0	05
50	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	02
51	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	02
52	1	1	0	2	0	0	0	0	0	0	1	1	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	04
53	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	02
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00
55	1	1	1	3	1	1	1	1	0	0	0	4	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	13
56	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	03
57	1	1	1	3	0	0	0	0	0	1	0	1	0	1	1	1	1	0	4	0	0	0	0	0	0	0	0	0	08
58	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	5	0	0	0	0	0	0	0	0	0	06
59	1	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	03
60	1	1	3	1	0	1	1	1	0	0	4	1	0	1	1	1	1	1	5	0	0	0	0	0	0	0	0	0	12
61	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	03
62	1	1	0	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	03
63	1	1	1	3	1	1	1	1	1	1	0	6	1	1	1	1	0	0	4	1	0	0	0	1	0	0	0	2	15

Student Number	Book Orientation 1	2	11	Total	Print-direction Concepts 3	4	5	6	7	9	16	Total	Letter-word Concepts 8	19	21	22	23	24	Total	Advanced-print Concepts 10	12	13	14	15	17	18	20	Total	Grand Total
01	1	1	1	3	1	1	1	0	0	1	1	5	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	1	15
02	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	1	0	1	1	1	1	0	5	21
03	1	1	1	3	1	1	1	0	1	1	1	6	0	1	1	1	1	1	5	0	0	0	0	0	0	0	0	0	0	14
04	1	1	0	2	1	1	1	0	1	0	0	4	1	1	1	0	1	1	5	0	0	0	0	0	0	0	0	0	0	11
05	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	1	1	17
06	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	1	1	19
07	1	1	1	3	1	1	1	1	1	1	1	7	0	1	1	1	1	1	5	0	0	0	0	0	0	0	0	0	0	15
08	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	0	0	0	0	2	18
09	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	0	1	17
10	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	1	1	0	0	4	20
11	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	1	1	0	0	0	1	5	21
13	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	0	0	0	0	2	18
14	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	0	1	17
15	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	0	5	0	0	0	0	1	0	0	0	0	1	16
16	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	04
17	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	04
18	1	1	1	3	1	0	0	0	0	0	1	2	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	07
19	1	1	1	3	1	1	1	0	1	1	1	6	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	0	15
20	1	1	1	3	1	0	1	1	1	1	1	6	1	1	1	0	1	0	4	0	0	0	0	0	0	0	0	0	0	13
21	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	0	1	5	0	0	0	0	1	0	0	1	0	2	17
22	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	0	1	1	1	4	20
23	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	0	0	1	0	1	3	19
24	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	1	0	1	1	1	0	0	4	20
25	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	1	1	1	1	1	1	1	7	23
26	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	0	1	0	0	3	19
27	1	1	1	3	1	1	1	1	1	1	1	7	0	1	1	0	1	1	4	0	0	0	0	0	1	0	0	0	1	14
28	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	1	1	1	1	1	1	7	23
29	1	1	0	2	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	0	1	16
30	1	1	1	3	1	1	1	0	1	1	1	6	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	0	14
31	1	1	1	3	1	1	1	0	1	1	1	6	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	0	15
32	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	0	0	0	1	5	21
33	1	1	1	3	0	1	1	0	1	1	1	5	0	1	1	1	1	0	4	0	0	0	0	0	1	1	0	0	2	14
34	1	1	0	2	1	1	1	0	0	0	0	3	0	1	1	1	1	0	5	0	0	0	0	1	1	0	0	0	2	12
35	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	1	0	1	1	1	0	0	5	21
36	1	1	0	2	1	1	1	1	1	0	1	6	1	1	1	1	1	1	6	0	0	0	0	1	0	1	0	0	2	16
37	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	04
38	1	1	0	2	1	1	1	0	0	0	0	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	06
39	1	1	1	3	1	1	0	0	1	1	0	4	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	0	13
40	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	1	1	1	1	1	1	0	6	22
41	1	1	1	3	1	1	1	1	0	1	1	6	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	0	1	16
42	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	0	1	0	0	0	1	19
43	1	1	1	3	1	1	1	1	1	1	1	7	0	1	1	0	1	1	4	0	1	0	0	1	1	1	1	1	5	19
44	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	1	1	1	7	23
45	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	1	1	1	1	7	23
46	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	0	1	0	0	0	1	17
47	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	0	0	1	5	21
48	1	1	1	3	1	1	1	1	1	1	0	6	1	1	1	1	1	1	6	0	0	0	0	1	1	1	1	0	4	19
49	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	1	0	0	0	3	19
50	1	1	1	3	1	1	0	1	1	0	0	4	1	0	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	11
51	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	0	7	23
52	1	1	0	2	1	1	1	0	1	0	0	4	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	0	12
53	1	1	1	3	1	1	1	0	1	1	1	6	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	0	1	16
54	1	1*	0	2	1	1	1	0	0	0	0	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	06
55	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	1	0	0	2	18
56	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	0	0	4	0	1	0	0	1	1	1	0	0	4	18
57	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	1	8	24
58	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	0	0	0	0	2	18
59	1	1	1	3	1	1	1	1	1	0	1	6	1	1	1	1	1	1	6	0	0	0	0	1	1	1	0	0	3	18
60	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	1	1	1	0	1	1	0	6	22
61	1	1	1	3	1	1	1	1	0	1	1	6	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	0	1	16
62	1	1	1	3	1	1	1	0	1	1	1	6	1	1	1	1	1	1	6	0	0	0	0	1	1	0	0	0	2	17
63	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	1	0	1	1	6	22

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Student Number	Book Orientation 1	2	11	Total 3	Print-direction Concepts 4	5	6	7	9	16	Total	Letter-word Concepts 8	19	21	22	23	24	Total	Advanced-print Concepts 10	12	13	14	15	17	18	20	Total	Grand Total
01	1	1	1	3	1	1	1	0	1	1	6	1	1	1	0	1	0	4	0	0	0	0	0	0	0	0	0	13
02	1	1	1	3	1	1	1	1	1	0	6	1	1	1	1	1	1	6	0	1	1	0	1	0	1	0	4	19
03	1	1	1	3	1	1	1	1	1	1	7	0	1	1	1	1	1	5	1	1	1	1	1	1	1	1	8	23
04	1	1	1	3	1	1	1	1	1	0	6	1	1	1	1	1	0	5	0	0	0	0	0	0	0	0	0	14
05	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	0	0	0	0	0	16
06	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
07	1	1	1	3	1	1	1	0	1	1	6	0	1	1	1	1	0	4	0	0	0	0	0	0	0	0	0	13
08	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	0	5	21
09	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	0	1	5	1	0	0	1	0	0	0	1	3	18
10	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	0	0	4	20
11	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	0	8	24
13	1	1	1	3	1	1	1	1	1	1	7	0	1	1	1	1	1	5	1	1	1	0	1	0	0	0	4	19
14	1	1	1	3	1	1	1	1	1	1	7	0	1	1	1	1	1	5	0	0	0	0	1	1	0	0	2	17
15	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	0	3	19
16	1	1	1	3	1	1	1	0	1	0	5	1	1	1	0	0	0	3	0	0	0	0	0	0	0	0	0	11
17	1	1	1	3	1	1	1	0	1	1	6	1	1	1	0	0	1	4	0	0	0	0	1	0	0	1	2	15
18	1	1	1	3	1	1	1	0	1	1	6	1	1	1	1	0	1	5	0	0	0	0	0	1	0	0	1	15
19	1	1	1	3	1	1	1	0	1	1	6	1	1	0	1	0	1	4	0	0	0	0	1	0	0	0	1	14
20	1	1	0	2	1	1	1	0	1	1	6	1	1	1	0	0	1	4	0	0	0	0	0	0	0	0	0	12
21	1	1	1	3	1	0	0	0	0	0	2	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	1	12
22	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
23	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	1	1	1	7	23
24	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	0	1	1	0	0	3	19
25	1	1	1	3	1	1	1	0	1	1	6	1	1	1	1	1	1	6	0	0	0	0	1	1	0	0	2	17
26	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
27	1	1	1	3	1	1	1	0	1	0	5	1	1	1	1	0	1	5	0	0	0	1	0	0	0	1	2	15
28	1	1	1	3	1	1	1	0	1	1	6	1	1	1	1	1	0	5	0	1	1	1	1	0	0	1	5	19
29	1	1	1	3	1	1	1	0	1	1	6	1	1	1	1	1	1	6	0	0	0	0	1	1	0	1	3	18
30	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	1	3	19
31	1	1	0	2	0	1	1	0	1	1	5	1	1	1	1	1	1	6	0	0	0	0	0	1	0	0	1	14
32	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
33	1	1	1	3	1	1	1	1	1	1	7	0	1	1	1	1	1	5	0	0	0	0	1	1	0	0	2	17
34	1	1	1	3	1	1	1	1	1	0	6	0	1	1	1	0	0	3	1	1	0	0	1	1	0	0	3	15
35	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	0	1	5	21
36	1	1	1	3	1	1	1	1	1	1	7	1	1	1	0	1	1	5	0	0	0	0	1	0	0	1	2	17
37	1	0	1	2	1	1	1	0	0	1	5	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	10
38	1	0	1	2	1	1	1	0	1	0	5	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	09
39	1	1	1	3	1	1	1	0	1	1	6	0	1	1	1	1	0	4	1	0	0	0	1	0	0	0	1	15
40	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	1	1	7	23
41	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	3	19
42	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	1	17
43	1	1	1	3	1	1	1	1	1	1	7	1	1	1	0	0	1	4	0	1	0	0	1	1	0	1	4	18
44	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
45	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
46	1	1	1	3	1	1	1	1	1	1	7	0	1	1	0	1	0	3	0	0	0	0	1	0	0	0	1	14
47	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	0	1	1	0	1	4	20
48	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	0	3	19
49	1	1	1	3	1	1	1	1	0	1	6	1	1	1	1	1	1	6	0	1	1	0	0	0	0	0	2	17
50	1	1	0	2	1	1	0	0	1	1	5	1	0	1	1	1	1	5	0	0	0	0	0	0	0	0	0	12
51	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
52	1	1	1	3	1	1	1	0	1	0	5	1	1	1	1	0	0	4	0	0	0	0	0	0	0	0	0	13
53	1	1	1	3	1	1	1	0	1	0	6	4	1	1	1	0	0	0	3	0	1	0	0	0	1	0	0	2	12
54	1	1	0	2	1	1	0	0	1	1	5	1	1	1	1	1	0	5	0	0	0	0	0	0	0	0	0	12
55	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	1	1	1	0	0	1	5	21
56	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	1	0	0	5	21
57	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	0	0	1	5	21
58	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
59	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	1	1	0	1	1	5	21
60	1	1	1	3	1	1	1	1	1	0	6	1	1	1	1	1	1	6	0	1	1	0	0	0	0	0	2	17
61	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	0	0	0	1	17
62	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	0	1	0	0	0	2	18
63	1	1	1	3	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	0	1	5	21

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Student Number	Book Orientation 1	2	11	Total	Print-direction Concepts 3	4	5	6	7	9	16	Total	Letter-word Concepts 8	19	21	22	23	24	Total	Advanced-print Concepts 10	12	13	14	15	17	18	20	Total	Grand Total
1	1	1	1	3	1	1	1	1	1	1	0	6	1	1	1	1	1	1	6	0	1	0	0	1	0	0	1	3	18
2	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
3	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
4	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	0	1	0	0	1	3	19
5	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	1	0	6	22
6	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
7	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
8	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
9	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
10	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
11	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
12	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
13	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
14	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
15	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	5	21
16	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
17	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
18	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	0	0	0	0	1	2	18
19	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
20	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	0	1	5	0	0	0	0	1	0	0	1	2	17
21	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	0	4	0	0	0	0	1	0	0	1	2	16
22	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
23	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
24	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
25	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	1	1	6	22
26	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
27	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	1	1	7	23
28	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
29	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
30	1	1	3	1	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
31	1	1	3	1	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	1	1	0	1	6	22
32	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	1	0	1	3	19
33	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
34	1	1	1	3	1	1	1	1	1	1	1	7	0	1	1	1	1	1	5	0	0	0	0	1	0	0	1	3	18
35	1	1	3	1	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
36	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
37	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	0	0	1	4	20
38	1	1	1	3	1	1	1	1	1	1	0	6	0	1	1	1	1	1	5	0	0	0	0	0	1	0	1	1	16
39	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	0	0	0	0	0	0	1	17
40	1	1	1	3	1	1	1	1	1	1	1	7	0	1	1	1	1	1	5	1	1	1	1	1	1	1	1	8	23
41	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
42	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
43	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
44	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
45	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
46	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
47	1	1	1	3	1	1	1	1	1	1	1	7	0	1	1	1	1	1	5	0	1	0	0	1	0	0	0	2	17
48	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	1	1	1	1	0	1	6	22
49	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
50	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
51	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	0	0	0	1	1	0	1	3	19
52	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
53	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	0	0	0	1	1	0	1	4	20
54	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	0	5	1	1	1	0	1	1	0	1	6	21
55	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	0	5	0	1	1	1	1	0	0	1	5	20
56	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	7	23
57	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	0	0	1	1	0	5	21
58	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	0	1	1	1	1	1	0	1	8	24
59	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	6	22
60	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	0	1	7	23
61	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	8	24
62	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	1	1	1	0	0	1	5	23
63	1	1	1	3	1	1	1	1	1	1	1	7	1	1	1	1	1	1	6	1	1	0	0	1	1	0	1	5	21
																				1	1	1	1	1	1	1	1	8	24

DATA FOR INDIVIDUAL SUBJECTS

Student Number	Sex	Race	FLASC	MRT	MAT	TERA	GIHN	Ph Seq	FLP A-III	FLP A-V	FLP B-III	FLP B-X	FLP B-XII	CAP 1 Total
01	M	B	27	46	19	22	3	0	17	07	07	20	02	01
02	M	W	36	68	51	41	6	5	20	09	18	20	09	13
03	F	B	32	63	55	43	5	0	18	08	02	20	08	02
04	M	W	25	68	27	23	4	0	06	10	12	05	05	01
05	M	B	29	63	47	40	6	0	14	08	17	20	04	01
06	F	B	20	65	54	45	6	0	20	09	03	09	10	04
07	M	W	33	37	19	28	3	0	12	08	01	12	06	02
08	M	W	42	69	55	42	6	1	19	08	03	13	03	06
09	F	W	27	69	41	38	6	5	20	10	04	15	07	02
10	M	W	31	58	47	34	6	3	17	07	18	18	10	04
11	F	W	31	70	53	37	7	5	20	10	17	19	08	13
12	Parental Permission Not Granted													
13	M	W	33	54	49	40	6	0	17	07	16	20	10	06
14	M	O	20	66	46	36	6	0	20	06	14	20	09	00
15	F	B	36	59	46	42	6	1	20	07	19	20	09	07
16	F	B	19	38	24	16	3	0	09	05	00	00	04	00
17	M	W	31	36	31	20	4	0	10	09	00	09	06	02
18	F	B	29	47	36	29	5	0	05	07	01	08	05	00
19	M	B	23	51	23	31	4	3	18	07	17	18	09	05
20	M	W	23	47	23	19	4	0	12	05	00	00	02	01
21	F	W	30	54	33	30	5	2	19	09	10	13	05	06
22	F	W	42	68	46	39	7	4	20	08	23	20	08	11
23	F	W	36	64	55	45	7	1	20	06	25	20	09	08
24	F	W	42	62	39	35	6	4	20	09	24	20	10	05
25	F	W	36	64	32	35	5	5	11	09	05	20	09	06
26	M	W	38	59	37	36	5	4	15	09	02	14	05	08
27	M	W	36	60	25	76	4	4	20	07	08	20	07	05
28	M	W	26	66	55	44	6	4	20	07	25	20	10	14
29	F	W	34	60	35	32	5	5	18	08	13	18	06	07
30	M	W	31	66	38	36	6	0	07	08	05	12	09	01
31	M	W	32	53	28	33	4	0	03	07	00	00	02	01
32	F	W	37	63	55	43	7	2	20	09	24	20	09	04
33	M	B	21	61	47	32	5	0	17	09	12	17	09	03
34	M	B	23	54	20	30	5	0	20	08	08	14	05	04
35	F	W	36	70	53	39	6	0	17	10	07	18	08	03
36	M	W	42	51	28	34	5	5	20	09	03	16	06	08
37	M	B	27	31	19	23	3	0	13	08	00	00	08	00
38	M	W	29	24	16	27	3	0	10	06	00	00	04	00
39	M	W	33	64	34	29	5	2	15	08	05	11	08	01
40	M	W	42	68	55	49	7	3	20	08	23	19	07	04
41	F	W	31	67	49	36	6	0	14	08	18	18	06	04
42	F	W	34	66	48	33	6	3	20	09	20	19	09	04
43	F	B	25	69	51	41	6	0	20	07	14	20	09	08
44	M	W	42	71	55	49	7	5	20	10	12	20	09	06
45	M	W	42	73	54	50	7	5	20	10	24	20	09	13
46	F	W	23	58	20	25	5	0	14	08	02	09	08	02
47	F	W	36	62	43	35	6	5	20	09	21	19	10	15
48	M	W	29	68	44	29	5	2	17	08	24	18	09	07
49	F	W	33	70	51	37	6	0	17	07	08	18	09	05
50	M	W	31	55	21	15	3	5	16	10	09	17	10	02
51	F	W	39	70	54	43	6	1	19	09	03	14	06	02
52	M	W	32	56	31	25	3	1	19	06	05	16	08	04
53	M	W	35	47	30	30	4	0	11	07	02	05	09	02
54	M	B	31	27	31	20	3	0	03	10	00	00	03	00
55	F	W	42	68	44	41	5	4	20	07	23	20	10	13
56	M	B	42	69	34	31	5	5	17	10	01	00	08	03
57	F	W	35	66	54	38	6	0	20	10	24	20	09	08
58	M	W	42	68	54	43	6	5	20	08	13	20	08	06
59	F	W	28	68	55	38	6	1	20	08	16	20	06	03
60	M	W	36	73	55	46	6	5	20	10	23	20	10	12
61	F	W	38	65	41	31	5	5	19	09	11	20	06	03
62	M	W	39	62	29	23	3	0	02	09	02	09	02	03
63	M	W	31	69	52	45	6	4	20	09	24	20	10	15

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BIOGRAPHICAL SKETCH

Jonnie Penny Ellis grew up in Florida. She attended numerous public schools in northern and central Florida and was an honor graduate of Hillsborough High School in Tampa in 1954. Following high school, she was employed in the accounting department of a large business for several years. She married a high school business teacher and her business career ended after the birth of two children when her husband suggested that she register for classes at the university.

In September, 1960, Mrs. Ellis began attending night classes at the University of South Florida. In her junior year she was initiated into the Gold Key Honor Society. She received the degree Bachelor of Arts with a major in elementary education in April, 1966. She moved to Bradford County and began graduate work at the University of Florida two years later. In June, 1972, she earned the degree Master of Education with a major in reading. She began her doctoral studies in September, 1978. She completed the requirements for the degree Doctor of Philosophy in curriculum and instruction in December, 1982.

Mrs. Ellis has taught a variety of grade levels and subjects during her sixteen years in the teaching profession. From 1966-69 she taught grades three and five at Southside Elementary School in Starke, Florida. During her first year at Southside, her third child

was born at the end of a routine "teaching day." In 1969-70 she taught sixth grade science at Metcalfe Elementary School after moving to Alachua County. The next two years, she taught science to fifth and sixth grade students at Duval Elementary School. While at Duval she co-authored an article on precision teaching published in People Watching (1972, 1(2), 90-96). The next year she taught gifted students at Finley and Rawlings Elementary Schools. In 1973 she set up the communications lab at a new middle school, Fort Clarke, where she taught communication skills to students of all ability levels in grades six, seven, and eight. The following year, Mrs. Ellis went to Metcalfe Elementary School where she has been employed for the past eight years. While at Metcalfe, she was Title I teacher for two years. For the past six years she has been curriculum resource teacher at that school.

Mrs. Ellis is a past treasurer of the Alachua County Reading Council. She is a member of Delta Kappa Gamma, the International Reading Association and its state affiliate. She has worked with parent groups and conducted in-service workshops for teachers, in addition to her teaching responsibilities and graduate work.

Jonnie Ellis has been married to her husband, Leon, for twenty-five years. She has one son, Lonnie, and two daughters, Alisa and Elizabeth.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is full adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

William R. Powell, Chairperson
Professor of Instructional Leadership
and Support

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is full adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Ruthellen Crews
Professor of Instructional
Leadership and Support

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is full adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Stephen F. Olejnik
Assistant Professor of Foundations
of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is full adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Janet Larsen
Professor of Counselor Education

This dissertation was submitted to the Graduate Faculty of the Division of Curriculum and Instruction in the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December 1982

Dean for Graduate Studies and Research